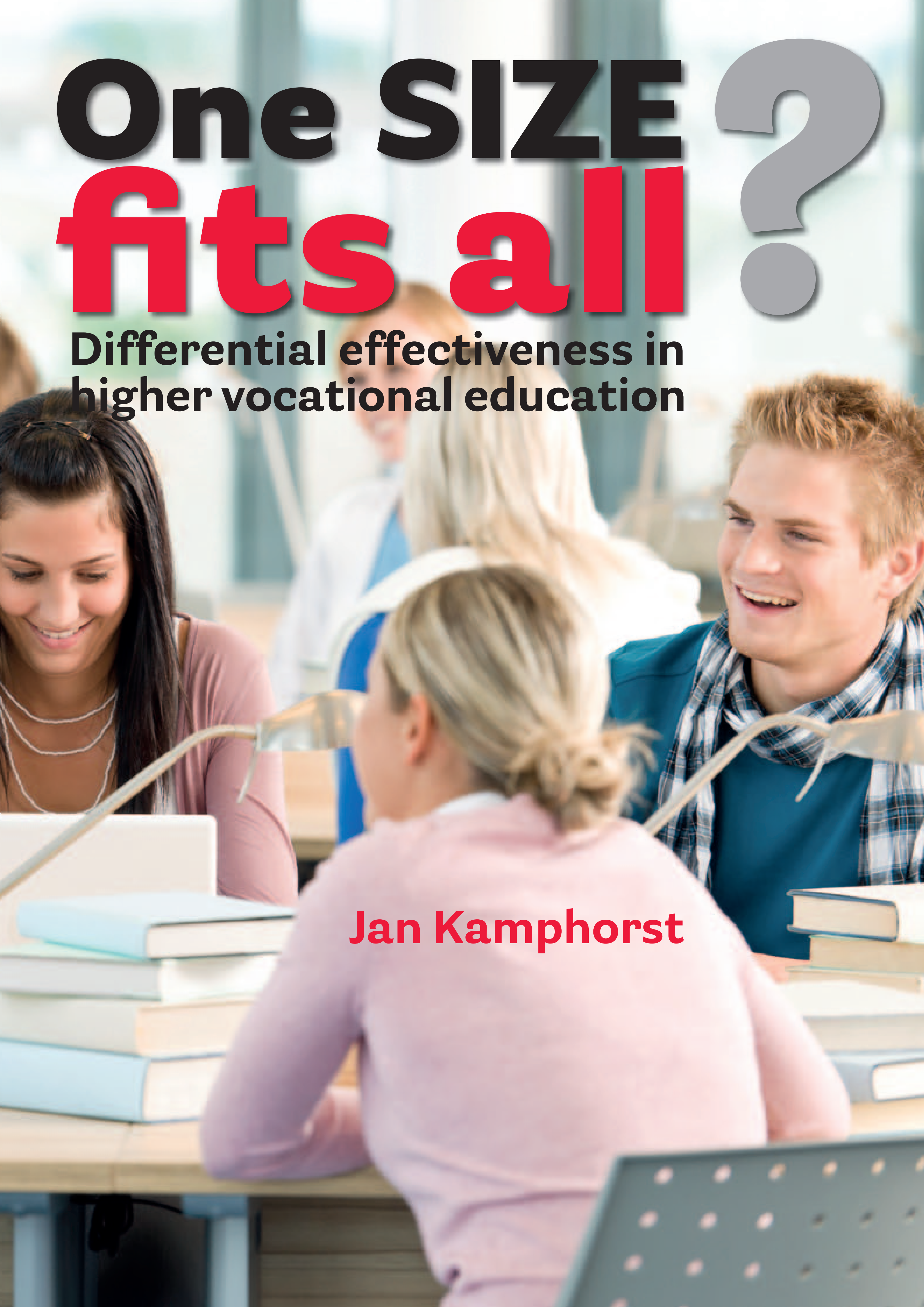
One SIZE fits all?

Differential effectiveness in higher vocational education



Jan Kamphorst

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ISBN: 978-90-367-6523-7

RIJKSUNIVERSITEIT GRONINGEN

One size fits all?

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Proefschrift

ter verkrijging van het doctoraat in de
Gedrags- en Maatschappijwetenschappen
aan de Rijksuniversiteit Groningen
op gezag van de
Rector Magnificus, dr. E. Sterken,
in het openbaar te verdedigen op
donderdag 14 november 2013
om 11.00 uur

door

Jan Cornelis Kamphorst
geboren op 25 juli 1955
te Utrecht

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Chapter 1 Introduction

1.1 Context and problem

Higher education in Western countries has expanded substantially in recent decades. This ‘massification’ of higher education has increased the share of educated members of the 25–34-year-old age group in the labour force up to 37% on average in OECD countries and 40% in the Netherlands (OECD, 2011, 40). Such developments have been stimulated by governments, which regard higher education as an important element of the shift toward knowledge-based economies, increased productivity with higher rates of return on investments, and higher income levels for citizens (Ianelli, 2004; OECD, 2011; Porter & Schwab, 2008). For these reasons, the Dutch government aims to reach 50% participation of higher education graduates in the labour force by the year 2020. In support of this goal, the government established universities of applied sciences to facilitate the expansion of higher education (Beerkens-Soo & Vossensteyn, 2009). Universities of applied sciences, or *hogescholen*, are responsible for the delivery of higher vocational education (in Dutch, *Hoger Beroeps Onderwijs* [HBO]). Before 1986, a patchwork of schools and in-service, topic-specific training centres prepared students for executive functions and professions in the ‘higher job’ echelons, such as business, engineering and technology, education, health care, social work, and arts. These schools and training centres varied considerably in their levels, contents and social status. Since 1986, they have merged into larger institutions, that is, the HBO. The mergers standardised higher vocational degree programmes in terms of both level and contents.

Today there are approximately 40 HBO in the country, which register almost two-thirds (420,000) of higher education students (CBS, 2011). After completion of a four-year programme, graduates have a professional bachelor degree and start working immediately. However, an increasing number of graduates also continue with a pre-master’s degree, followed by an academic master’s programme in a research university. More than one-third of higher education students (250,000) register in research universities (CBS, 2011). However, the focus of this dissertation remains on universities of applied sciences.

The growth of these HBO in the Netherlands also has been facilitated by the reserves of talented students who completed a higher secondary education track and thus are eligible for higher professional education (Ianelli, 2004; Tieben & Wolbers, 2010). In turn, the number and diversity of the student population in higher vocational education has increased considerably, with several related trends. First, the number and proportion of enrolling students with a track in senior secondary vocational education (SSVE, see Appendix A) has been growing. The number of students with an SSVE diploma who started in the first year of a higher vocational education programme increased from 18,000 in the 1990–91 academic year to more than 30,000 in 2012–13, accounting for 31.8% (up from 26.4%) of enrolees (CBS, 2013). Second, the participation of women in Dutch higher education is vastly increased, such that it now exceeds men's participation (Ianelli, 2004; Ministry of Education, Culture, and Science [MOCW], 2011; Tieben & Wolbers, 2010). In 1948–50, three times more male students between the ages of 18 and 25 years (7,350 or 7%) initiated higher education than female students (2,690 or 2.5%), though in higher vocational education, this difference was smaller, with 2,350 male students and 1,600 female students. By 2010, there were 348,000 female students in higher education, representing 52% of the student population (Idenburg, 1964; OECD, 2011). Third, students from lower socioeconomic class backgrounds are better represented in modern higher education, though still lower in proportion, at 28%, than the group of students whose fathers pursued a higher education diploma (i.e., 50%; Orr, Gwość, & Netz, 2011; Tieben and Wolbers, 2010). Fourth, many more minority students are entering higher vocational education. Although the likelihood of enrolling in higher education remains relatively low for non-Western minorities (OECD, 2007), the number of students from this group has increased from 27,000 in 1995 to 81,500 in 2008 (CBS, 2009). Fifth, the number of older students (>30 years) in higher education increased by 10% from 1990 to 2008, though this rate of increase is less than that in higher education overall (42%) in this period (MOCW, 2009).

Universities of applied sciences thus appear successful in fulfilling the societal desirable aim of expanding education. They offer higher vocational education to a growing number of students, which has resulted in increased output, in terms of the supply of educated professionals in labour markets. However, this quantitative growth also has been somewhat thwarted by a lack of efficiency, in terms of costs per student, and lack of effectiveness, in the form of dropout rates and study delays. Only 50–60% of students graduate within the nominal four-year study timeline, and approximately 30% of students who enrol leave the programme before graduation (HBO-Raad, 2011). Generally, two-thirds of these dropouts occur in the first year, more than half of which is due to 'switchers' (see Section 1.2).

For higher education, the main problem is poor effectiveness, despite attention devoted to this concern by both administrators and politicians. This dissertation offers some theoretical explanations of the low average academic success among first-year students in universities of applied sciences. Five empirical studies, presented as Chapters 4–8, propose and test explanations for the variations in first-year academic success. These studies are based in two contrasting theoretical approaches, using either psychological or interactionalist concepts (see Chapter 2).

The remainder of this chapter begins by defining the concepts of effectiveness, efficiency, and academic success and detailing how academic success has developed in recent years in HBO (Section 1.2). After presenting an overview of evidence-based explanations for the lack of first-year academic success (Section 1.3), Section 1.4 outlines the overall aims of the dissertation. Finally, this chapter concludes with an overview of Chapters 2–9.

1.2 Effectiveness, efficiency, and academic success

The definition of effectiveness and the related concept of efficiency stems from a framework offered by Borghans, Van der Velden, Büchner, Coenen, and Meng (2008). Academic success, in terms of dropout, study progress, and perceived competence, provides an aggregated indication of the effectiveness of educational systems and institutions.

1.2.1 Definitions of effectiveness and efficiency

Effectiveness is the degree to which educational institutions realize their three major functions: qualification and socialization, selection, and allocation. Efficiency pertains to the costs needed to fulfil these functions (Borghans et al., 2008).

The qualification and socialization function deals with the question of whether education equips students with competencies relevant for next phases in education or entry into the labour market. The selection function entails assessments of students' attained competence, to direct them to the right type of education and allow them to attain certification at an appropriate end level. Thus selection can be assessed by whether students have acquired sufficient competence, as evidenced by the number of credits they have earned or their ability to pass a certification exam. The allocation function refers to optimal referrals for the next stage of education or work. An optimal referral can be established through good information and advice about the next phase in study or job choices.

Borghans et al. (2008) connect different dimensions of efficiency to the three effectiveness functions. The efficiency of the qualification and socialization function is defined in terms of the costs, total instruction time or didactical methods, needed to achieve the added value of education in terms of learning outcomes such as competence. The efficiency of the selection function reflects the internal rate of return, expressed by a student's probability of attaining a diploma or time until graduation, for example. Finally, external efficiency pertains to material and immaterial costs and the yields of education for individuals and society.

1.2.2 Definitions of academic success

Academic success is a student's successful adjustment and performance, according to the demands of a particular programme (Pascarella & Terenzini, 1991). We distinguish three measures, such that dropout and study progress indicate the effectiveness of the selection function, whereas perceived competence is an indicator of the effectiveness of the qualification and socialization function.

Dropout occurs when students do not return to the same programme in the next year (Berger & Lyon, 2005; NVAO, 2012). Thus students who transfer to a research university ('vertical transfer') or temporarily leave for more than one year ('stop out') are included in this definition (Pascarella & Terenzini, 2005; Berger & Lyon, 2005). Also, students who move to the same programme at other universities of applied sciences ('horizontal transfer') or to a different programme of the same or another institution ('switch') are regarded as dropouts. Therefore, on the programme level, dropout is the quotient of the number of first-time, first-year students who leave a programme, divided by the number of first-time enrolments in the first year, irrespective of whether students continue into the second year of another programme.

The dropout percentages in the next section are based on the information available on the national level, which excludes horizontal transfers and switches. That is, percentages on the national level are lower than on institutional levels. However, this dissertation relies on institutional dropout data.

Students' study progress is the number of attained credits after some period; credits that students receive through exemptions are excluded. To attain a bachelor's degree, students in universities of applied sciences must earn 240 credits, nominally during four years. During their first year, they must earn 60 credits. On average, the first-year programme consists of 20 courses. In the Dutch system of higher education, one credit is equivalent to 28 study hours, and all first-year courses are obligatory. However, many institutions lack reliable information on first-year study progress on the institutional level; this information is available only on an individual or programme level. Thus the study progress information in this chapter is presented indirectly, on the basis of the time needed until graduation or dropout.

Perceived competence[1] is the self-assessed capacity of first-year students to execute job tasks, independently or in cooperation with other students, and clearly communicate these capabilities to others. This definition assumes that students' perceptions or assessments are

[1] Researchers use the terms 'self-perceived competence' (e.g., Covington, 2000) or 'perceived competence' (e.g., Bandura, 1997; Baartman & Ruijs, 2011; Pajares, 1997), sometimes interchangeably (Bruinsma, 2004; Graham, 1994). This text uses 'perceived competence'.

good indicators of how competent they actually are at the end of the first year (Baartman & Ruijs, 2011). These perceptions are frequently used as outcome measures of educational innovations and predictors of future professional behavior. Perceived competence thus serves as a qualitative counterpart to the number of credits earned by students.

1.2.3 Developments in dropout

Dropouts from universities of applied sciences are persistent problems, especially related to the diversity of the student population. Table 1.1 shows a breakdown of dropouts in the first year for Dutch universities of applied sciences during 2005–2010, by type of secondary education, gender, ethnicity, and sector (HBO-Raad, 2012).

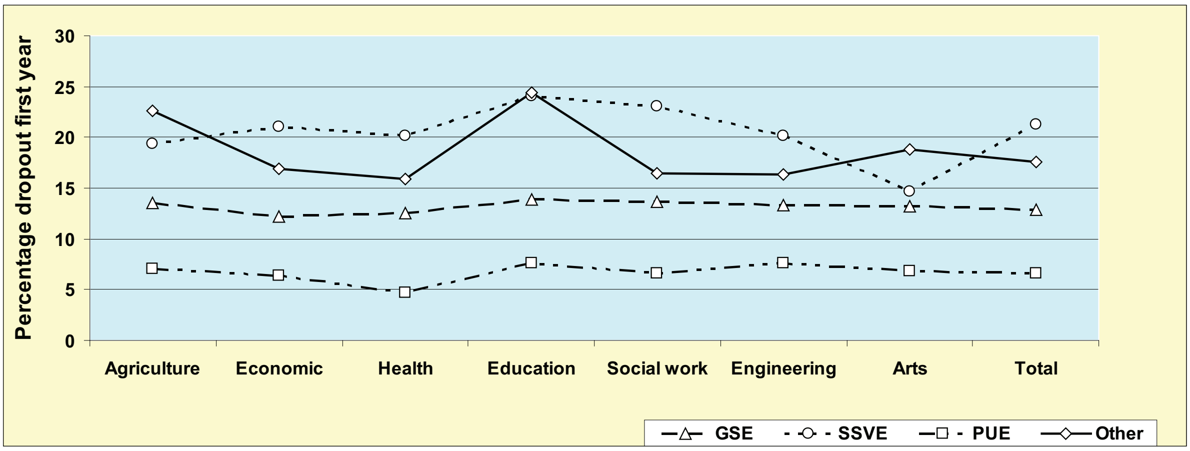
Table 1.1: Dropouts from Dutch HBO by Background Characteristics and Sector

	2006	2007	2008	2009	2010
SGE	14.5%	14.8%	12.6%	12.9%	12.8%
SSVE	21.3%	22.3%	19.9%	21.3%	22.5%
PUE	8.2%	7.5%	6.9%	6.6%	6.7%
Other	21.9%	22.0%	18.0%	17.6%	17.3%
Men	19.2%	19.5%	16.7%	17.6%	17.6%
Women	15.6%	15.8%	14.1%	14.2%	14.6%
Majority	16.6%	17.1%	14.6%	15.0%	15.2%
Non-Western minority	18.6%	18.6%	16.1%	17.7%	17.4%
Unknown	30.2%	32.3%	33.3%	22.9%	19.8%
Western minority	19.4%	19.0%	18.4%	17.4%	19.1%
Agriculture	16.7%	18.5%	15.6%	17.0%	18.8%
Economics	17.3%	17.4%	15.2%	15.2%	15.6%
Health care	15.7%	15.1%	13.9%	13.7%	14.1%
Education	20.0%	20.7%	18.0%	18.1%	19.3%
Social studies	18.3%	19.2%	16.6%	17.8%	18.1%
Engineering (incl. Technology)	15.1%	16.2%	14.0%	15.3%	14.6%
Arts	14.1%	13.6%	13.5%	14.0%	14.0%
Total	17.2%	17.5%	15.3%	15.8%	16.0%

Note: The percentages present the 'real' dropout of students who enrolled on 1 September, excluding 'switch' and 'transfer'.

Source: http://www.hbo-raad.nl/hbo-raad/feiten-en-cijfers/cat_view/60-feiten-en-cijfers/63-onderwijs

As Table 1.1 illustrates, dropout relates to the type of secondary education (see Appendix A), gender, ethnicity, and sector. Students from pre-university education (PUE) perform better than those coming from senior general secondary education (SGE). Students from SGE outperform those who previously were in senior secondary vocational education (SSVE) or those with another educational background. Women drop out less than men. Furthermore, Dutch students (majority) are performing better than other students. Also, there are differences across disciplines: Students in the fields of health care and arts are performing relatively better, whereas students in agriculture and cattle breeding and education perform poorly. The differences in dropout rates by background characteristics are detailed in Figure 1.1 for the 2009–2010 cohort in higher vocational education.



Source: http://www.hbo-raad.nl/hbo-raad/feiten-en-cijfers/cat_view/60-feiten-en-cijfers/63-onderwijs

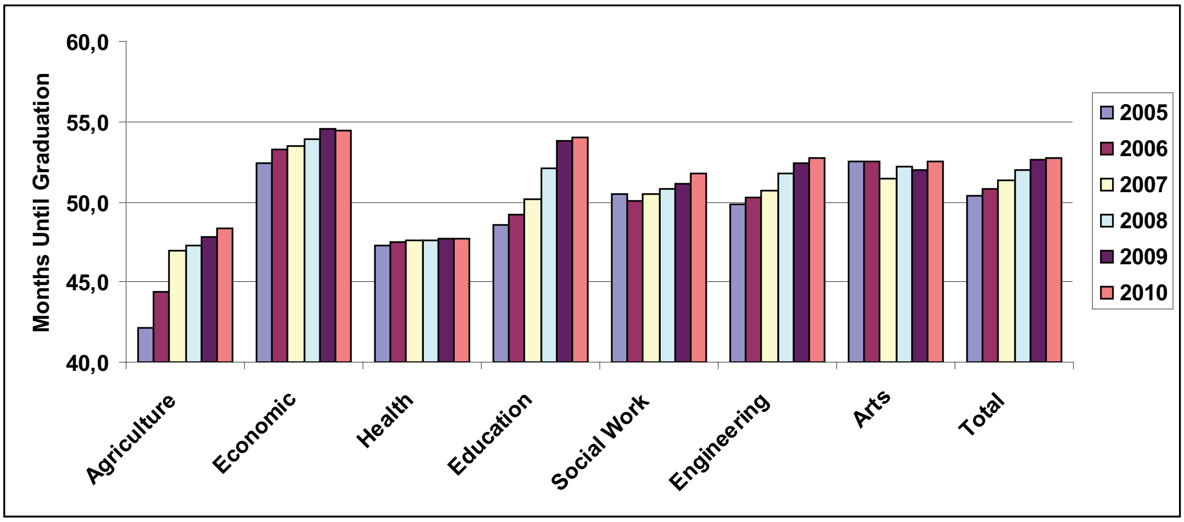
Figure 1.1: Average Percentage Dropout by Discipline and Secondary Education Background, Cohort 2009–10

As this Figure shows, in terms of dropout, students with PUE outperform their peers from SGE. Dropout is highest among students with a SSVE or another background, and dropout percentages vary by discipline.

1.2.4 Developments in study progress

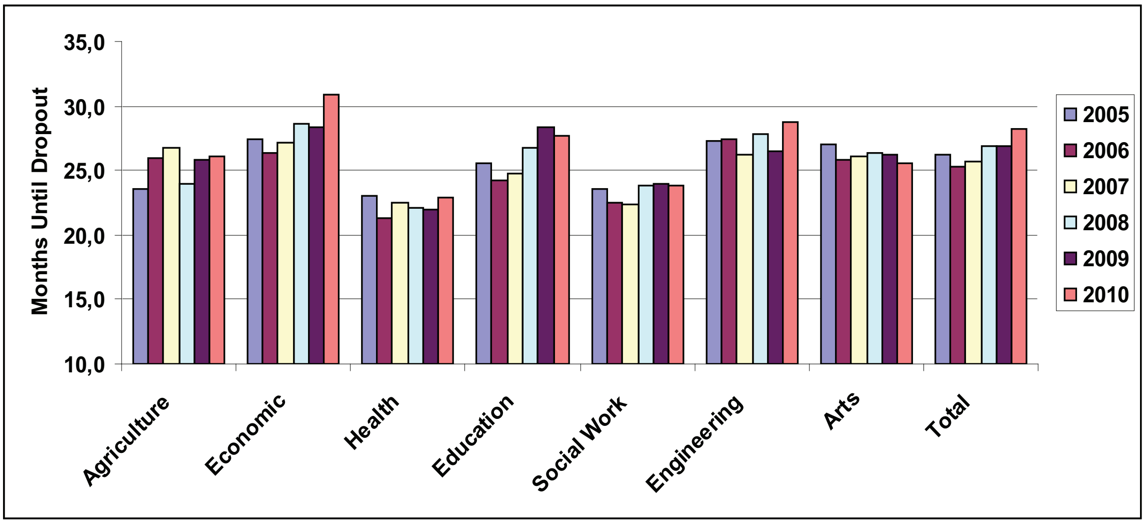
Many students in universities of applied sciences are taking longer than four years to graduate. On average, dropouts stay in the programme for longer before they leave. Figures 1.2 and 1.3 depict how the persistence of graduates and dropouts developed between 2005 and 2010. Both figures emphasize the increase in the average number of months before dropout and graduation. The duration of stay is longest for students in economics and shortest for students in health care.

Figure 1.2 shows that students who graduated in 2005 studied 50 months on average. By 2010, this average increased to 53 months. Furthermore, students in economics stayed considerably longer in the programme than students in health care. Although not shown in this figure, women stayed approximately 50 months before graduation throughout the period 2005–2010, whereas the duration for men increased from 51 to 56 months. Moreover, women who ultimately dropped out were more persistent than men, with men leaving after 24–26 months, whereas women stayed 27–30 months before dropping out in this period.



Source: http://www.hbo-raad.nl/hbo-raad/feiten-en-cijfers/cat_view/60-feiten-en-cijfers/63-onderwijs

Figure 1.2: Average Number of Months until Graduation by Discipline, 2005–2010

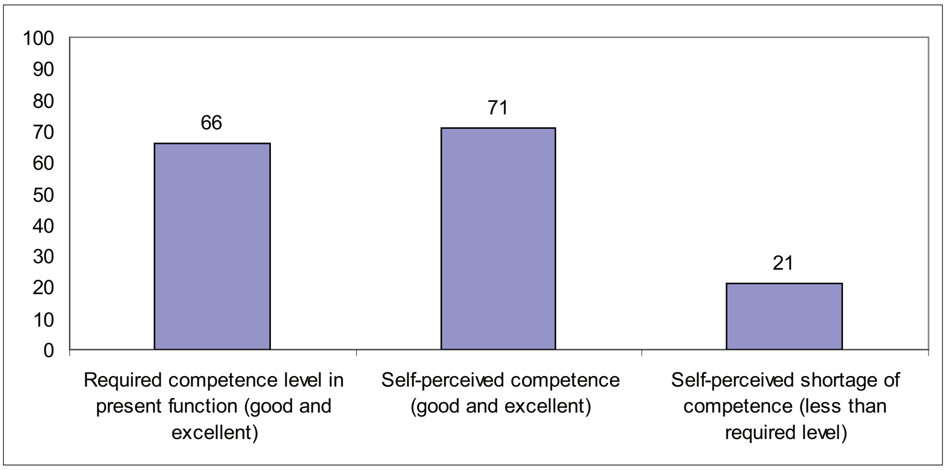


Source: http://www.hbo-raad.nl/hbo-raad/feiten-en-cijfers/cat_view/60-feiten-en-cijfers/63-onderwijs

Figure 1.3: Average Number of Months until Dropout by Discipline, 2005–2010

1.2.5 Perceived competence

Data on perceived competence of first-year students are not available on a national level. Instead, as an introduction to the subject, the data of the annual labour market survey conducted among graduates of HBO programmes on the average perceived competence levels are presented here. Figure 1.4 summarizes these perceived competence levels among employed professionals for the cohort 2008–09, one and a half years after their graduation.



Source: ROA, 2012. Based on percentages for 23 competencies.

Figure 1.4: Perceived (required, acquired, and gaps in) Competence of Employed Graduates from 2008–09, measured 1.5 Years after Graduation

According to Figure 1.4, 66% of employed graduates estimate that their competence level is good or excellent for their current jobs; 71% perceive their acquired level of competence as good and excellent. However, 21% of graduates also believe their competence is below the required level. This picture contrasts with their status as recent graduates, which should imply that they are competent.

In summary, the relationship of competence, earned credits, and graduation appears problematic, likely due to the different functions of education. Chapter 4 explores this challenge in further detail.

1.3 Explanations for first-year dropout and delays in study progress

Many explanations have been offered for the lack of academic success, using economic, organizational, sociological, and psychological perspectives (Bijleveld, 1993; Braxton, 2000; Pascarella & Terenzini, 2005; Van den Berg, 2002;). These theoretical perspectives overlap considerably in the observed factors. This dissertation primarily reflects Tinto's (1993) interactionalist theory of student departure and psychological theories that emphasize the importance of learning quality and motivation for academic success (e.g., Entwistle & Peterson, 2004). Chapter 2 presents both of these broad approaches; Chapters 4–8 cover their specific elements. The remainder of this section provides an overview of influential factors for academic success: background characteristics, preparation, transition and first-year experiences, learning process, and programme- and institutional-level factors. These influences each relate to either or both theoretical approaches, as illustrated in the global comparison (see Table 1.2).

1.3.1 Background characteristics

Gender, age, type of secondary education and prior achievements, ethnicity, and socioeconomic status (SES) likely influence academic success. Women complete their studies faster than men (HBO-Raad, 2012; Shah & Burke, 2002; Van den Berg & Hofman, 2005), obtain higher exam marks, and attain more credits (Van der Hulst & Jansen, 2002; Jansen, 2004; De Jong et al., 1997). Yet Hattie (2009) argues that gender differences in learning conditions and performance are relatively small. Generally, older students appear less successful than younger students (Prins, 1997; Van den Berg & Hofman, 2005). Regarding the type of secondary education (HBO-Raad, 2012), students with a SSVE diploma drop out more than students with an SGE diploma, though this influence of educational background also interacts with gender and discipline. Prior achievements in secondary education are important for academic success (Hattie, 2009; McKenzie & Schweitzer, 2001), such that many Dutch researchers have confirmed that secondary education grades affect study progress in degree programmes (Bruinsma, 2004; Van den Berg & Hofman, 2005; Van der Hulst & Jansen, 2002; Jansen & Bruinsma, 2005; Jansen & Suhre, 2010; Suhre, Jansen, & Harskamp, 2007; Torenbeek, 2011).

First-generation students face relatively high risks of dropout (Ishitani, 2007; Stage & Hossler, 2000). Second- or later-generation students, whose parents completed higher education, express more positive study attitudes, spend more time studying, and attain better exam results than peers whose parents completed secondary education as their highest level (Hattie, 2009; Van den Broek, Wartenbergh, Hogeling, Brukx, Warps, Kurver, & Muskens, 2009; Warps, Wartenbergh, Kurver, Muskens, Hogeling, & Pass, 2010). In contrast, some researchers (e.g., Beekhoven, De Jong, & Van Hout, 2002; Prins, 1997; Van den Berg & Hofman, 2005) report that SES does not matter for academic success in Dutch research universities. The ethnic background of students has been reported as influential for study progress (Hofman & Van den Berg, 2003; Severiens & Wolff, 2009).

1.3.2 Preparation

The preparation of students before entering higher education is important for their academic success. During their secondary education, students collect information, orient themselves toward pedagogic-didactic approaches to teaching and learning, and prepare for the content knowledge. Their experiences, acquired through these actions and orientations, prove critical to academic success during the first year (Astin, 1993; Lowe & Cook, 2003; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007; Ozga & Sukhnandan, 1998; Yorke & Longden, 2008). Many studies of higher education in the Netherlands have shown that the grades on final examinations in secondary education, as indicators of the degree of preparation, offer good predictors of academic success (e.g., Beekhoven et al., 2002; Bruinsma, 2003; Van den Berg, 2002; Van der Hulst & Jansen, 1995). Jansen and Suhre (2010) find that secondary school study skills preparation is a good predictor of achievement in the first year. However, students enrolled higher education since 2002—after the implementation of innovations in active learning (*studiehuis*) and new clusters of subject contents (*profielen*)—express less satisfaction with the content aspects in their transition (Warps & Kersten, 2005), suggesting that *studiehuis* students might not perform any better than students who enrolled before 2002. In contrast, De Vries and Van der Velden (2005) report that students are more satisfied with this transition, due to their better preparation in secondary education. Terlouw, De Goede, and Kienhuis (2009) examine the influence of extra-curricular math classes but find no effect on math performance during the first year in higher education or on study progress after one year.

1.3.3 Transition and first-year experience

First-year transition factors, such as poor choices, student satisfaction, effort and time spent on study, active learning, commitment, and integration, relate closely to academic success. Some authors use catch-all terms for these factors, such as engagement (Kuh et al., 2007; Van der Werf, 2005) or involvement (Astin, 1993; Berger & Milem, 1999).

Wrong choices and poor choice motives may explain dropout rates in higher education (Van den Broek, van de Wiel, Pronk, & Snijders, 2006; Feldman, Smart & Ethington, 2004; Holland, 1997; Stage & Hossler, 2000; York & Longden, 2008). Wrong choices relate to age, in that younger students tend to change their minds more and exhibit discontinuities between the courses or tracks they took in secondary education and their study choices in higher education. Students are less committed to their programme or institution when they can choose from more alternatives for their further education (Okun, Goegan, & Mitric, 2009). However, too narrowly defined programmes also can be detrimental to the fit between students and programs.

Satisfaction is significant for study progress (Bean & Bradley, 1986; Beekhoven et al., 2002; Pike, 1991; Suhre et al., 2007; Yorke, 2000). Satisfaction is related to student well-being and effort (Astin, 1993; Pascarella & Terenzini, 2005). Since Carroll's (1963) work, many studies have confirmed the influence of time spent on study and study progress (Suhre et al., 2007; Van den Berg & Hofman, 2005; Van den Broek et al., 2006; Vos, 1992). Active and independent study time appear more important for study progress than simple contact hours. Bruinsma and Jansen (2005) find that active contact hours increase grades in higher education. However, Vos (1992) notes that more than 325–400 contact hours can reduce independent study-hours and thus decrease attained credits. Contact hours compete with independent study. The number of contact hours, even if this time is spent in active learning, is a necessary but not sufficient condition for greater effectiveness and shorter study duration (Schmidt, 2012; Schmidt, Cohen-Schotanus, & Arends, 2009).

Commitment, social integration, and academic integration (Tinto, 1993; Pascarella & Terenzini, 2005) also determine students' persistence. Prins (1997) confirms the importance of academic, but not social, integration for explaining study progress. Beekhoven et al. (2002) find an effect of integration (combined social and academic) on study progress. Similarly, a sense of belonging offers a good predictor of persistence (Hurtado & Carter, 1997; Meeuwisse, Severiens, & Born, 2010; Warps et al., 2010).

1.3.4 Learning process

Various factors related to the first-year learning process are important for academic success. Students with intrinsic motivation and high aspiration levels and expectations are less likely to drop out (Prins, 1997). General self-efficacy, which relates to motivation, is another good predictor of academic success (Bandura, 1997; Stage & Hossler, 2000). Similarly, self-confidence offers an important predictor of dropout (Prins, 1997), because self-confident students tend to be more actively involved in learning activities than less confident students.

Students with better time-management skills experience less stress (Macan, 2000) and likely attain higher grades (Britton & Tesser, 1991). The influence of time management on study progress is modest though (Torenbeek, Suhre, Jansen, & Bruinsma, 2011). Jansen and Suhre (2010) find that students who receive training in time management skills at the beginning of their first year exhibit more motivation to study, more regular study behaviors, and less academic stress; they also attain more credits by the end of the year. Other skills, such as rehearsal- and memory-based skills, cognitive study skills (e.g., connecting ideas), and meta-cognitive study skills (e.g., knowing when to study and plan) also had bearing on academic success (Gettinger & Seibert, 2002; Hattie, 2009; Jansen & Suhre, 2010).

1.3.5 Programme- and institutional-level factors

Organization of the curriculum, instruction quality, and examination quality also influence students' academic success. In curricula with fewer parallel courses per period, fewer periods in an academic year, more compensatory possibilities between study components, and more activating and integrated forms of teaching, students earn more study credits (Jansen, 2004; Prins, 1997; Van den Berg & Hofman, 2005). Furthermore, students with teachers who stimulate active and collaborative learning, give challenging assignments, elicit cognitive activity, create a positive classroom climate, and are available for and provide appropriate feedback exhibit more engagement in learning, such that they spend more time and report more gains from their learning (Van den Broek et al., 2006; Hattie, 2009; Pike, 1991; Umbach & Wawrzynski, 2005). Accordingly, students persist more and complete their studies more quickly in institutions that foster the quality of faculty–student interactions (academic integration). Furthermore, growing research indicates that consistent educational concepts across universities, leadership, coherent measures of education and examination procedures, and enhanced teacher quality influence the academic success of individual students and the effectiveness of higher education institutions (Hattie, 2009; Jansen, 2004; Kuh, Kinzie, Schuh, & Whitt, 2010; Scheerens, 2004).

Table 1.2, which reveals how these factors relate to the two major theoretical approaches that underlie this dissertation, implies a tendency to examine different factors that relate, somehow, to academic success. The overlap is limited. Of course, this overview of factors could be extended with other categories that fit with an interactionalist (e.g., home environment) or a psychological (e.g., personality or intelligence) approach (Hattie, 2009; Pascarella & Terenzini, 2005), but doing so would not change the essence of the table.

Table 1.2: Focus of Two Major Approaches globally compared

	Interactionalist approaches	Psychological approaches
Background characteristics	+++	+
Preparation	+++	+
Transition and first-year experience (commitment, social, and academic integration)	+++	
Learning process (learning approach and motivation)		+++
Teacher	+	++
Curriculum		++
Institution	+++	+

In summary, explaining academic success or, from an institutional point of view, effectiveness in higher education can be a complex enterprise, because it involves many factors on the micro-, meso-, and macro-levels (Jansen & Terlouw, 2009). As a corollary, higher education institutional policies consist of a mixture of measures at the levels of individual students, programs, teachers, and institutions. For years, higher education institutions, supported by reports and advice published by governmental bodies, committees, national and international councils, and researchers, have continued to develop objectives and initiatives to increase student satisfaction, teacher qualifications, number of contact hours, guidance of first-year students, cooperation with secondary schools, entry-selection, transparent study choice information, timely dismissal of poor performing students, students' ability levels, and so forth. Despite these objectives and activities, the effectiveness of higher vocational education institutions remains too low—and is even decreasing (see Figure 1.2).

1.4 Aim and research questions

The focus of this dissertation is the two main theoretical strands that may help explain why higher vocational education students drop out or lag behind in their study progress. In interactionalist theories (Tinto, 1993), social and academic integration is central, whereas psychological theories focus on motivation and learning (e.g., Eccles & Wigfield, 2002; Entwistle & Peterson, 2004). Both theories hold promise for solutions to the problems of dropout, study delays, and competence development among first-year students in higher vocational education. They also provide the foundations for the five empirical studies that constitute this dissertation (Chapters 4–8). Thus, the general aim of this dissertation is to examine the influence of psychological and interactionalist factors that appear likely to diminish attrition and increase first-year institutional output in Dutch higher vocational education. Three research questions derive from this general aim:

1. Which factors pertaining to psychological and interactionalist approaches help explain the academic success of first-year students?
2. Does a combination of psychological and interactionalist factors offer added value for explaining academic success?
3. Do factors related to academic success work the same way in different environments and for different groups?

This final question also considers whether a single theoretical model can suffice to examine the influences of various factors on first-year academic success. An affirmative answer would imply the possibility of formulating general and powerful strategies to steer students' study progress. If the relationships among factors instead vary across environments and groups, one conceptual model may be insufficient for explaining the academic success of all students. In this case, the promotion of first-year academic success may not be possible on a general level; instead, it would need to be conducted on the level of specific groups or programmes in higher education. In this case, tailored first-year academic success policies become necessary at the programme level.

1.5 Dissertation outline

Chapter 2 introduces the interactionalist (e.g., Tinto, 1993) and psychological (e.g., Eccles & Wigfield, 2002; Entwistle & Peterson, 2004; Vermunt, 2005) approaches used in the empirical studies. Then Chapter 3 presents the design of the five studies. Data were collected among first-year students of five universities of applied sciences in the north-eastern part of the Netherlands in the academic years 2006–07 and 2008–09. The characteristics of the samples and research populations, instruments used for the data collection, data preparation, variables, and the methods for analysis are covered in this chapter.

The studies that constitute Chapters 4 and 5 relied on psychological frameworks. Chapter 4 addresses two research questions: (1) How do meaning-directed learning factors influence study progress (earned credits) and perceived competence? and (2) What is the exact nature of the relationship between earned credits and perceived competence? The data for this study came from first-year students of the 2006–07 cohort, who completed a self-reported questionnaire pertaining to meaning-directed learning (intrinsic value, procrastination, deep approach to learning, self-regulation) and perceived competence.

Chapter 5 addresses whether meaning-directed learning variables affect study progress the same way among minority and majority students. The data for this study were collected among first-year students in the academic year 2008–09, using the same instrument as in Chapter 4.

The studies described in Chapters 6 and 7 were situated within an interactionalist approach. Chapter 6, using concepts of Tinto's (1993) theory of student departure, compares female and male engineering students on several background and engagement variables, to answer two research questions. First, what are the differences between male and female engineering students when they enter higher education, with regard to their background characteristics, engagement, and academic success? Second, do gendered differences appear in the influences of these factors on academic success? The data used for this study came from a subsample of first-year engineering students for the academic year 2008–09.

In Chapter 7, an interactionalist model, based on Tinto (1993), is developed, tested, and specified for four disciplines. The research questions addressed are as follows:
(1) What connections exist between study progress and background characteristics, relating to prior education, experiences with the learning environment, and student behavior in the first three months of the first year? (2) Does a specification of the relations for different disciplines contribute to a better explanation of study progress in the first year? The data for this study were collected with an online questionnaire about the transition from secondary education to higher vocational education among 8,000 freshmen in academic year 2008–09.

Chapter 8 reports on an attempt to combine the concepts of an interactionalist approach (social and academic integration) with a psychological approach (meaning-directed learning variables) into one model. The research question is: Do social and academic integration affect students' study progress in a direct manner, or is their influence mediated by meaning-directed factors?

Finally, Chapter 9 summarizes the background and design of the studies and highlights the most salient results: Section 9.2 answers the three overarching research questions, Section 9.3 details some limitations, Section 9.4 details the theoretical implications of the five studies, and Section 9.5 reflects on the practical implications.

Chapter 2 Theoretical perspectives on academic success

2.1 Introduction

The factors that influence study success, dropout, and competence (i.e., academic success) have been studied from several perspectives. Bijleveld (1993) distinguishes psychological, societal, economic, organizational, and interactionalist approaches. Van den Berg (2002) offers distinctions of economic, societal, interactionalist, and school effectiveness approaches. Kuh et al. (2007) categorise extant theories and research on student success into sociological, organizational, psychological, cultural, and economic perspectives.

Most of the approaches have several drawbacks in common. They cannot explicate why certain individual or organizational characteristics influence academic success. They lack a longitudinal perspective. And they neglect experiences that prompt students' decisions to halt their studies (Bijleveld, 1993; Braxton, Hirschy, & McClendon, 2004). This dissertation adopts two theoretical perspectives to explain academic success in higher vocational education. First, it uses the concepts emphasised in Tinto's (1993) interactionalist theory of student drop out, which provides a closer focus on the relationships between individuals and their environment, such that it offers promise for explaining drop-out choices and perhaps better retaining students in higher education (Braxton et al., 1997, 2004). The properties of this interactionalist model and its merits are the topics of Section 2.2. Second, this dissertation relies on the broad family of learning and motivation theories, which prove relevant for explaining study progress. Several recent educational innovations in higher vocational education, including active learning, student-centred approaches, and learning to learn, originate in such motivation and learning theories. This psychological perspective appears in Section 2.3. Section 2.4 then introduces a model to combine the 'interactionalist' and 'motivation-and-learning' concepts, because such an integration may be fruitful for further research and better explanations of academic success. Section 2.5 offers an overview of the subsequent chapters of this dissertation.

2.2 Interactionalist approaches

This dissertation uses an interactionalist approach based on Tinto's (1993) model of student departure. 'Interactionalist' refers to interactions between individuals and the educational environment, resulting in some degree of engagement with the institution and learning (cf. Evans, Forney, Guido, Patton & Renn, 2010; Seidman, 2005). Tinto distinguishes two types of commitments that predict a person's likelihood of graduating. First, a student's individual goal commitments refer to his or her intentions to attain personal and educational goals. Second, a student's institutional commitment refers to a willingness to attain goals within a particular higher educational institution (Tinto, 1993, p. 43). Such commitments vary over time and are mutually reinforcing (Thomas, 2012). For example, through interactions with the academic and social environment, the student develops social and academic integration (Braxton et al., 2004), which prompts the transfer of initial commitments into subsequently stronger or weaker commitments.

Differences in individual characteristics can help explain why students in similar contexts differ in their commitment levels and social and academic experiences. Some students use different coping mechanisms to address the degree of (in)congruence between their own personalities and the study or learning environment. These mechanisms can have a substantial impact on whether a student leaves the programme (commitment below a critical level) or perseveres (commitment above a critical level). This process of attraction and distraction develops over time and results in conditional or unconditional acceptance of and commitment to a programme and an institution, as depicted in Figure 2.1.

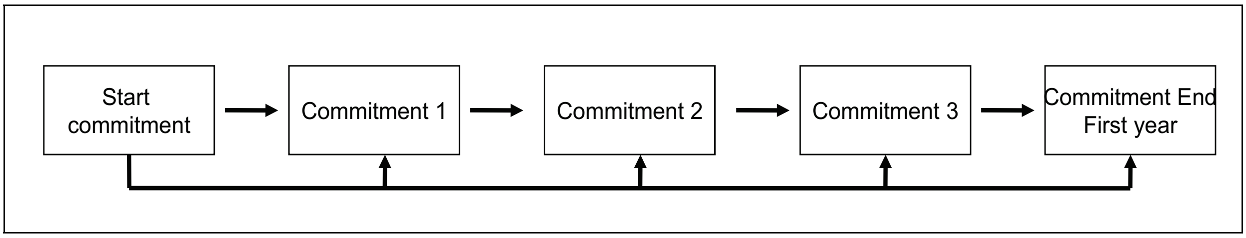


Figure 2.1. Developmental Dimension in Interactionalist Models

Students evaluate how well engaged they are with the programme by accounting for both environmental and individual factors. These evaluations can result in confirmation of initial commitments, subsequent commitments, and persistence—or else dismissal of prior commitments if the costs (financial, social, psychological) of continuation are too high or more attractive alternatives emerge (e.g., switch to another environment, a job).

Students who enrol at the start of the first year commit to their study, at least to the extent that they choose that particular study programme. The combination of factors that explain students' decisions to register for a programme, that is, their initial commitment, likely differs for each person. For example, the type and direction of their prior education affects this decision. A student with pre-university education is more likely to enter a research university than a higher vocational education institution. The socioeconomic status (SES) of the family also affects study choices, though in the Netherlands, the effect of SES largely fades after secondary education (Tieben & Wolbers, 2010). Furthermore, students acknowledge the difficulty of the programme and assess their chances of success when they choose (Beekhoven et al., 2002).

Other factors that are relatively more important for initial commitments are the levels of intrinsic and extrinsic motivation, students' ability levels in general and in certain subjects, and gender. A student's personality also is an important influence on study choices (Holland, 1997). Once students enter a programme though, other influential factors emerge to affect their evaluations of their initial commitment. These factors usually reflect their experiences in the first year, such as personal conversations with tutors or mentors, contacts with teachers during classes, teachers' feedback on assignments, grades earned on assignments and examinations, cooperation with peers, conversations with peers outside the classroom, general satisfaction with facilities of the learning environment, and so on.

Figure 2.2 thus shows the second dimension of interactionalist models. Students and learning environments continuously interact, and their interactions lead to commitments on not only the individual but also the programme level (e.g., Bean, 1980).

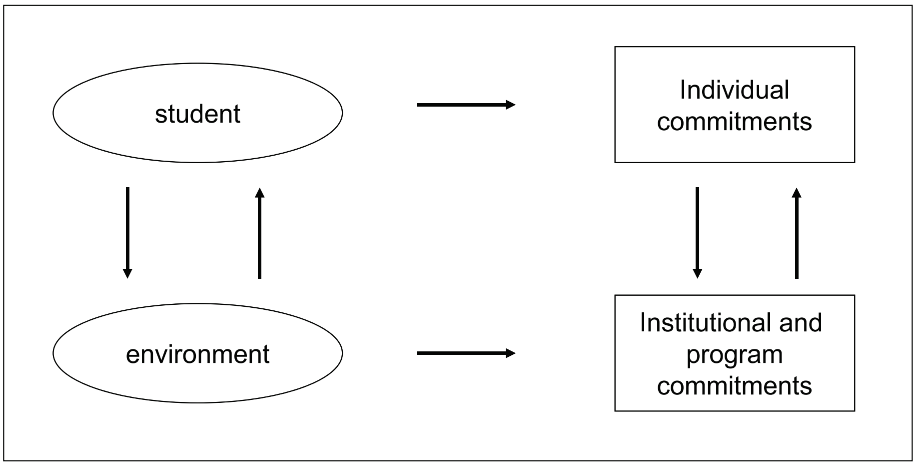
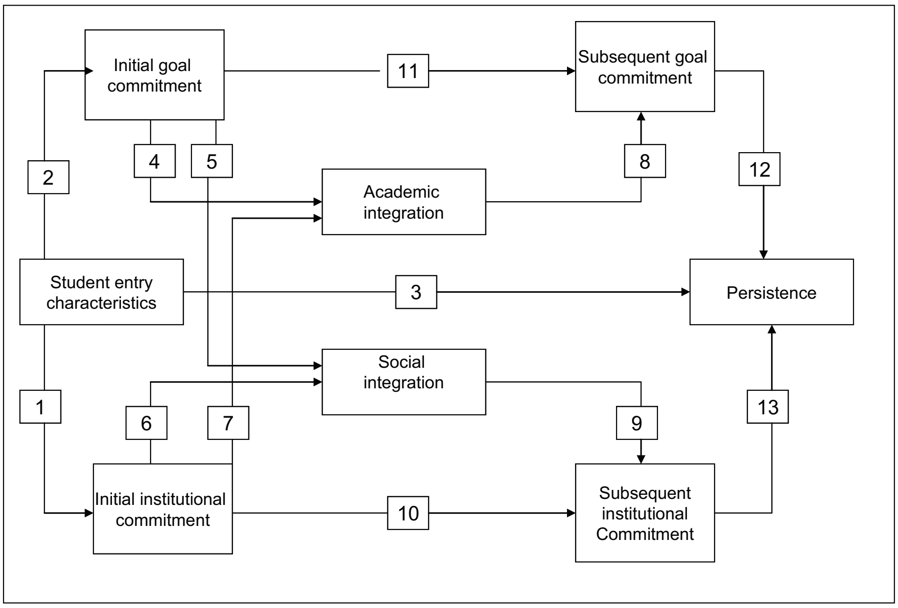


Figure 2.2. Interactionalist Dimension in Interactionalist Models

These interactions have consequences in terms of the commitments of individual students to institutions. Students might decide they are not committed and leave the programme, based on 'hard' (e.g., attained credits) or 'soft' (e.g., satisfaction or competence) outcomes. Meanwhile, institutions continuously try to probe—such as through evaluations and recording study progress—whether students' commitment levels are acceptable and if the conditions for commitment and academic performance remain on a sufficient level. An institution or programme can organize events or interventions to improve commitment, the conditions for commitment, and academic performance.

2.2.1 Tinto's model

Although other models have been proposed and partially or completely tested (Bean & Metzner, 1985; Cabrera, Castañeda, Nora & Hengstler, 1992; Pascarella, 1980; Spady, 1970; Stoecker, Pascarella & Wolfle, 1988), Tinto's (1975, 1993) model of student departure is by far the most widely applied interactionalist model (Braxton et al., 2004).



Source: Braxton, Hirschy, and McClendon (2004), based on Tinto (1975, 1993).

Figure 2.3. Tinto's Model of Student Departure

As Figure 2.3 shows, Tinto's model consists of 13 propositions, represented by path numbers. Entry characteristics and subsequent commitments directly influence persistence (paths 3, 12, and 13). The developmental dimension appears as arrows from student entry (or background) characteristics to initial commitments (paths 1 and 2), from initial commitments to social and academic integration (paths 4 to 7), and from initial to subsequent commitments (paths 10 and 11). The influences of initial commitments on persistence are partly mediated by social and academic integration and subsequent commitments (paths 1, 2, and 4–11). The strength of these influences can vary with student entry characteristics (paths 1 and 2). The influence of the environment, the second dimension, is crystallized in students' subsequent institutional commitments and perceptions of the quality of interactions with peers and teachers (social and academic integration).

2.2.2 Criticisms and adaptations of Tinto's model

Although Tinto's theory has been fruitful for research and practice, Braxton, Sullivan, and Johnson (1997) criticize the model on several dimensions. First, they question the viability of the academic integration construct and its influence on commitment. Second, empirical support for Tinto's theory in different institutional types has varied. Empirical backing has been relatively strong in residential colleges and universities, such that propositions 1, 9, 10, 11, and 13 (Figure 2.3) receive support in most research (Braxton et al., 1997). However, in other institutional contexts, empirical evidence is weaker; in commuter universities and two-year colleges for example, only propositions 1 and 10 receive support. Third, the validity of Tinto's theory is based mainly on tests with samples of "Caucasian male and female students" (Braxton et al., 2004, p. 18). Other researchers also note these drawbacks and offer revisions accordingly (Beekhoven et al., 2002; Bijleveld, 1993; Cabrera et al., 1992; Yorke & Longden, 2004).

For example, Bijleveld (1993) remarks that interactionalist approaches do not examine differences between disciplines and that Tinto's (1987) original model disregarded educational and institutional factors. Yorke and Longden (2004) maintain that Tinto's concepts cannot cover all the influences on student persistence, such that they plead for a more inclusive theory that considers not just sociological but also psychological and economic factors. Beekhoven et al. (2002) find empirical support for linking the concepts of integration theory with rational choice theory. Adding rational choice variables, such as expectations regarding success and time until graduation, influenced by parental education level and availability of financial resources, increases the explained variance of academic progress. Many Dutch researchers also have extended Tinto's interactionalist model with time spent on the task (Carroll, 1963; Creemers, 2006), a variable that relates to students' levels of academic integration and academic success (Beekhoven et al., 2002; Prins, 1996; De Jong, Roeleveld, Webbink & Verbeek, 1997; Schmidt, Cohen-Schotanus, Van der Molen, Splinter, Bulte, Holdrinet & Van Rossum, 2010). In an early extension of Tinto's model, Cabrera et al. (1992) compare two interactionalist approaches: Tinto's (1975, 1987) model and Bean's (1980) student attrition model. In Bean's model, persistence depends, directly or indirectly, on a student's 'intent to persist', attitudes, institutional fit, and external factors (e.g., parental approval, encouragement from friends, available finances). Both Tinto's and Bean's model resulted in improved explanations of persistence. Cabrera et al. (1992) thus conclude that these theories converge, such that including environmental variables (parental approval, attitudes, encouragement) would produce an attractive model that better explains college persistence.

Although interactionalist theories emphasize the importance of the educational environment for academic success, they also do not deny the influence of individual characteristics. The more students get involved academically, such as by having more contact with faculty, the more likely 'they become involved in their own learning and invest more time and energy to learn' (Tinto, 1993, p. 131; Tinto, Goodsell & Russo, 1993). In turn, more effort should lead to enhanced learning and persistence (Tinto, 1993). Interactionalist theories also acknowledge the importance of motivation toward initial and subsequent goals and institutional commitments for their intentions to persist and actual persistence. Furthermore, an inability or lack of motivation to meet academic standards can induce departure, though most decisions to leave likely result from a lack of academic and social integration, combined with feelings of isolation (Tinto, 1993). The exact means by which motivational and learning processes are shaped in the classroom by student contacts with faculty, Tinto (1993) asserts, is subject to speculation and demands more empirical evidence.

2.3. Psychological approaches

Psychological approaches to explaining differences in academic success are characterised by motivation and learning models. Motivation is a central predictor of academic success, and researchers have defined the concept in various ways, starting from different theories and standpoints, to distinguish various components that are important for student learning and academic outcomes. Well-known approaches include self-efficacy theory (Bandura, 1986), the expectancy-value model of motivation (Eccles & Wigfield, 2002), and self-determination theory (e.g., Ryan & Deci, 2000).

Learning is frequently cited together with motivation as an important predictor of academic success. Depending on the research tradition, different terms describe students' learning and studying (Lonka, Olkinuora, & Mäkinen, 2004). Lonka et al. (2004) distinguish students' approaches to learning (or 'learning styles', Boekaerts, 1999; Vermunt, 1992; 'learning orientations', Entwistle, 1988), based in a European research tradition, from information processing and self-regulated learning, both based in a North American research tradition.

2.3.1 Motivation

Three main theories refer to motivation.

Self-efficacy

Self-efficacy belief refers to the belief in 'one's capability to organize and execute the courses of action required to manage prospective situations' (Bandura, 1997; Van Dinther, Dochy & Segers, 2011; Pajares, 1997). Self-efficacy affects the effort students invest in a task, how long they will persevere in difficult tasks, and the amount of stress and anxiety they experience when conducting a task (Bandura, 1997; Pajares, 1997).

Expectancy-value

In expectancy-value theory, the value component of motivation reflects students' incentives for performing a task (Eccles & Wigfield, 2002; Pintrich & De Groot, 1990). Values can be based on a range of aspects, such as learning or performance goals, intrinsic orientation (i.e., the enjoyment a person obtains or expects to obtain from performing the task), or extrinsic orientation (i.e., the utility of an activity in terms of yields for future plans or activities). The expectancy component refers to beliefs about how well the person will perform a task, him- or herself (Eccles & Wigfield, 2002).

Self-determination

Self-determination theory elaborates on different states of motivation (Deci & Ryan, 1985; Ryan & Deci, 2000). Individuals (students) have an innate tendency toward authentic, intrinsic self-motivation in their behaviors and activities. When the basic psychological needs of relatedness, autonomy, and (perceived) competence are not invoked, people become apathetic and alienated, such that they do not act at all—what Ryan and Deci (2000) call a-motivation. Between intrinsic motivation and a-motivation, the two extremes of the continuum, are different forms of extrinsic motivation, accompanied by different regulatory styles with varying degrees of contextual and individual influences. Depending on the degree to which regulation is autonomous or self-determined, Ryan and Deci (2000) distinguish external, introjected, identified, and integrated regulatory styles. Across all these types of extrinsic motivation though, behavior gets triggered by some external reward, in contrast with inherent satisfaction in an activity that results when the person is intrinsically motivated. In terms of self-determination theory, the challenge for education is to provide external regulation to ensure optimal fulfilment of the needs for relatedness, autonomy, and competence. To the extent that external regulation evokes a state of intrinsic motivation among students, they should attach more value and interest to learning tasks and achieve better performance. Accordingly, with an increase of intrinsic motivation, the importance of external regulation should diminish.

2.3.2 Learning

The 'approach to learning' concept, distinguishing between 'deep' and 'surface' learning, was first introduced by Marton and Saljö (1997). The concept of information processing, with distinctions among serialist, holist, and versatile styles, appears in Pask (1976). Yet these different perspectives also are related (Entwistle, 2001).

Approaches to learning

In the approaches to learning tradition, Marton and Säljö (1997) suggest two approaches: deep and surface. Deep learning is characterized by 'active engagement with the content, leading to extensive elaboration of the learning material while seeking personal understanding', whereas surface learning is understood as the 'use of routine memorisation to reproduce those aspects of the subject matter expected to be assessed' (Entwistle, 2001, p. 595). 'To understand ideas for yourself' is characteristic of the first approach; 'to cope with course requirements' is characteristic of the second (Entwistle, 2001). Other researchers also suggest a third approach, 'strategic', which is characterized by the deployment of activities that align with assessment demands, to guarantee academic performance (Biggs, 1979; Ramsden, 1979; Lonka et al., 2004).

Information processing

The information processing perspective originates with work by Pask (1976), who differentiates holist from serialist learning strategies. Students using a holist learning strategy prefer personal organization and a broad view try to comprehend concepts and seek relationships across them. Their learning intention is to understand (Entwistle & Peterson, 2004). Facts thus are perceived as illustrations of theories and concepts. Students with a serialist learning strategy instead prefer operational learning, characterized by step-by-step learning and a focus on isolated facts, details, and the relation of evidence to conclusions. Their learning intention is to reproduce knowledge (Entwistle & Peterson, 2004; Pask, 1976). Holist strategies relate to deep learning approaches, whereas serialist strategies show similarities with surface learning approaches (Entwistle & Peterson, 2004).

Self-regulated learning

The self-regulated learning perspective has developed in close connection with the concept of information processing. Research in this tradition focuses on study strategies related to learning processes and their outcomes (Lonka et al., 2004; Pintrich, 2000). To explain the relation between self-regulation and learning, Boekaerts (1999) uses a three-layer model (Figure 2.4).

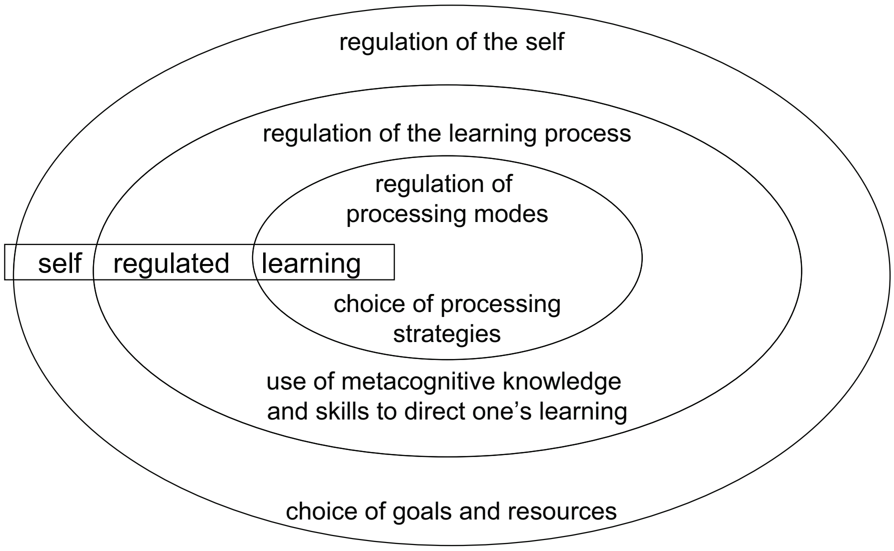


Figure 2.4. Boekaerts' (1999) Three-Layer Model of Self-regulated Learning

The first or inner layer of the model refers to the way students learn; the second layer pertains to the way they regulate their learning; and the third layer consists of the goals students set for themselves as learners. Goals affect the regulation activities of students, which in turn determine how students learn. Characteristic of self-regulated learning is the use of meta-cognitive skills and strategies, such as orienting, planning, executing, monitoring, evaluating, and correcting learning tasks (Boekaerts, 1999). Information about students' goals provides an indication of why they deploy the learning activities they do. At this point, it also is important to make a distinction between self-initiated and teacher-initiated learning activities (Boekaerts, 1999).

Criticisms

Several criticisms of this perspective centre on the validity of approaches to learn, learning strategies, and self-regulation constructs (cf. Boekaerts, 1999; Severiens, Ten Dam & Van Hout-Wolters, 2001). First, as Boekaerts (1999) observes, the choices students make between, say, a surface versus a deep learning approach when confronted with learning tasks is not always evident. Students may not be consciously aware of how they learn or the approaches they could use. Second, self-regulation stresses cognitive aspects of learning (first layer), so many applications of this theory disregard the importance of motivational and affective (e.g., anxiety, self-confidence) aspects (related to the self, the third layer). Third, measuring approaches to learn and self-regulation may be invalid, because it requires students' self-descriptions of how they learn and refers to activities that may vary over long periods of time. Thus it is often not clear whether concepts such as learning style or learning orientation refer to a (temporary) state, which can be influenced by the learning environment and vary over time, or (stable and innate) traits of the students.

2.3.3 Relationship between motivation and learning

The starting point for theories of motivation and learning is the individual perspective. To a certain extent, students actively select appropriate learning modes. Regulatory activities are 'mediators between personal and contextual characteristics and actual achievement or performance', and 'students can flexibly combine different goals and strategies in different ways in different contexts' (Pintrich, 2004, p. 388). Different motivation and learning activities thus relate. Surface-level learning is often connected with extrinsic motivation, lower self-efficacy, and anxiety. Vermunt (1998) identifies the combination of these characteristics as part of a *reproduction-directed* learning style (cf. Entwistle & Peterson, 2004). In contrast, deep-level learning generally is associated more with intrinsic motivation, high self-efficacy, and low anxiety levels. Together, these characteristics underlie a *meaning-directed* learning style (Entwistle & Peterson, 2004; Vermunt, 1998). Moreover, self-regulation (the connection of goals and learning) can be learned and consists of several stages of development (Ryan & Deci, 2000). In earlier stages, students' learning depends more on teachers' activities. In later stages, they have learned how to steer their own learning process. This process of diminishing external regulation and increasing self-regulation is called scaffolding. In this sense, the academic context clearly is important for motivation and learning and, thus, for academic success.

2.4. Combining social and academic integration with motivation and learning

Bruinsma (2003) notes that an explicit link with academic and social integration is rare in motivation and learning research. In their review of interactionalist theory, Braxton et al. (1997) find only three relevant articles that connect the theoretical concepts with motivation and learning theories. Specifically, Stage (1989) reveals positive relationships between students' motivational orientations and their level of social and academic integration. Brower (1992) examines how motivation-related variables, which facilitate or hinder life task orientations (e.g., academic achievement, social interaction, well-being), affect commitment and integration. Finally, Peterson (1993) explores the relationship between 'perceived career decision-making self-efficacy' and social and academic integration.

More recent publications (1998–2012) combine some concepts of social and academic integration with motivation, as defined by expectancy-value theory, self-efficacy theory, or self-determination theory, as well as with learning theories. Braxton, Milem, and Sullivan (2000) show that facilitating content discussions in the classroom has a positive impact on students' sense of belonging to the institution. Faculty who deploy active learning, or 'any class activity that involves students in doing things and thinking about the things they are doing' (Bonwell & Eison, 1991; cited in Braxton et al., 2000), have positive impacts on students' retention. Torenbeek, Hofman, and Jansen (2010) highlight the relationship between social integration (contact with peers and lecturers) and motivation, measured in terms of class behaviors (e.g., conscientiousness, preparation, engagement). Severiens and Schmidt (2009) report higher levels of social and academic integration when learning takes place in a problem-based learning environment, though their analysis did not focus specifically on the learning process. In another study, Severiens and Wolf (2008) find a positive relationship between academic integration and learning quality, such that higher levels of academic integration relate to deep approaches to learning. Bruinsma (2003) notes a small influence of involvement, which offers a proxy for integration, on deep information processing.

Yet Arum and Roksa (2011, p. 135) conclude that the evidence for the influence of social and academic integration on learning is not convincing: 'these social experiences [gathered in student-student and student faculty interactions] may yield higher graduation rates, [but] it is not clear that they would also facilitate students' cognitive development'. They explain this disappointing observation according to the potential tension between learning and persistence. That is, two processes are at work: the 'mostly social process of persistence by which students derive satisfaction and become attached to the institution, and a mostly academic process of achievement whereby students earn good grades and steadily accumulate course credits' (Arum & Roksa, 2011, p. 135; Charles et al., 2009).

A condition for this cognitive development—or in the context of higher vocational education, development of professional competence—is that the institutional environment stimulates appropriate learning and motivation through processes of social and academic integration. Therefore, social and academic integration cannot be an end goal of education but rather should be beneficial for psychological concepts such as a deep approach to learning, intrinsic motivation, self-confidence and self-regulation, and, ultimately, learning outcomes. The idea of linking different theoretical concepts indicates simultaneously the challenge and the limitation of research that is based on either interactionalist or psychological models. A fusion of the concepts underlying the two theories in one comprehensive approach might therefore be effective for explaining academic success (Figure 2.5).

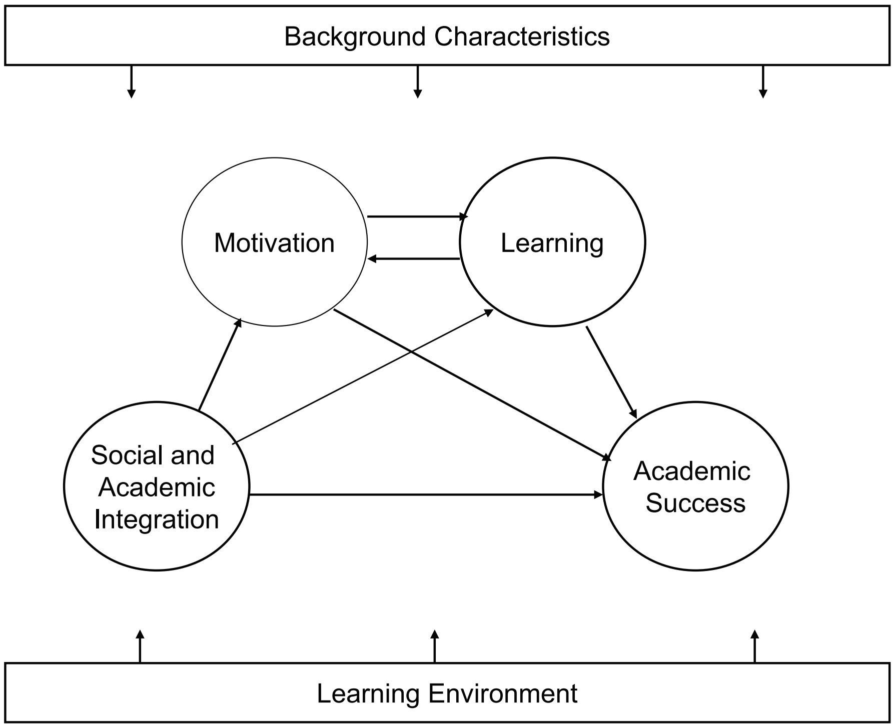


Figure 2.5. Conceptual Model: a Combined Integration, Motivation, and Learning Approach

Figure 2.5 illustrates the idea that motivation and learning mediate part of the influence of social and academic integration on academic success. The relationships among these variables are moderated by characteristics of individuals and the learning environment.

2.5 Theoretical approaches and concepts in empirical studies

In Figure 2.5, the variable to be explained, that is, the dependent variable, is academic success. Academic success is defined in three ways for this dissertation: study progress, dropout, and perceived competence. *Study progress* refers to the number of credits attained at the end of the first year in higher education, including credits attained after re-sits. The data for this variable came from student administrations on the programme or the institutional level of the universities. Study progress serves as the dependent variable for the studies reported in Chapters 4–8.

Dropout is when a student voluntarily or involuntarily does not re-enrol in his or her second year. At the programme or institutional level, it is defined as the percentage of students who leave during or at the end of the first year and do not continue as sophomores. Dropout, together with study progress, is the dependent variable in Chapter 6, which seeks to explain the academic success of women and men in engineering studies.

Finally, *perceived competence* is the self-assessed capacity to execute job tasks, independently or in cooperation with others. Students self-assessed their competence in five general items related to professional tasks nine months after the start in the first year. They could use their own discipline- or profession-specific associations for each item. This procedure produced a variable that indicates the perceived competence level of a diverse student group, across different disciplines. Table 2.1 contains an overview of the themes and theoretical concepts used in the subsequent empirical studies.

Table 2.1. Overview of Themes and Concepts in Empirical Studies of the Dissertation

	Ch. 4	Ch. 5	Ch. 6	Ch. 7	Ch. 8
Motivation	+	+			+
Deep approach to learning	+	+			+
Self-regulation	+	+			+
Social and academic integration			+	+	+
Perceived competence	+				
Dropout			+		
Study progress	+	+	+	+	+

Chapter 3 Data and method

3.1 Introduction

This dissertation seeks to examine the influence of various factors on dropout, study progress and competence. These factors originate in interactionalist theories on student departure, as well as learning and motivation theories. To conduct the studies presented in Chapters 4–8, the relevant data were collected among first-year students of five higher vocational institutions between 2006 and 2009. The main line of analysis consisted of the development of theory- and research-based (linear structural) models. These models in turn provided insight into how combinations of multiple factors might influence the dropout rates, study progress, and perceived competence of first-year students. The specific research questions, samples, and statistical methods are detailed in each chapter; this chapter instead introduces the general methodology, including the data collection (Section 3.2) and the methods of analysis (Section 3.3).

3.2 Data collection

The five studies of this dissertation used four different data sets. The first was collected through a questionnaire administered in May 2007 to first-year students of three universities of applied sciences who enrolled for the first time in the 2006–2007 academic year. This instrument consisted of 65 items related to first-year students' perceptions of the use of motivation and learning strategies and their actual study behaviors. The questionnaire also contained a measure of academic success, according to perceived competence.

The second data set was collected by the *werkgroep aansluitingsmonitor* ('working group transition monitor') during the 2008–2009 academic year. On behalf of six universities of applied sciences in the four north-eastern provinces of the Netherlands, this working group collects data about students' transition from secondary education into higher vocational education. Its general aim is to monitor students' preparedness for higher education and their first-year experiences. Therefore, it administers a questionnaire every two years, which has been constructed according to an interactionalist approach. The data collected refer to five broad questions, summarised in 26 items, pertaining to preparation (active learning, academic knowledge and skills) and the first-year experience (satisfaction with active learning, satisfaction with academic knowledge and skills, social and academic integration). Students receive requests to complete the questionnaire in December, three months after the start of their first year.

The third data set used the same instrument as the first data set. In this case though, the questionnaire was administered in May 2009 to first-year students of the same three institutions who had enrolled in higher education for the first time in the 2008–2009 academic year, and who had previously responded to the transition questionnaire. All three of the preceding questionnaires were administered online.

The student administrations of the relevant institutions provided the fourth data set. It offered data related to dropout rates, study progress, and background characteristics (gender, age, type of secondary education). An overview of the collected data and associated chapters appears in Table 3.1.

Table 3.1. Schematic Overview of Data Sets

	Motivation and Learning Data		Interactionalist Data	Academic Success	
	May 2007	May 2009	December 2008	October 2007	October 2009
Competence and earned credits (Ch. 4)	+			+[2,3]	
Motivation, learning, and study progress (Ch. 5)		+			+[2]
Women and men in engineering (Ch. 6)			+		+[1,2]
Disciplinary differences in determinants of study progress (Ch. 7)			+		+[2]
Integration, motivation, learning, and academic success (Ch. 8)		+	+		+[2]

Notes: Dependent variables: [1]Dropout, [2]Study progress, [3]Competence.

Chapters 4 and 5 rely on data pertaining to learning and motivation, combined with two indicators for academic success, competence and/or study progress. Chapters 6 and 7 use the interactionalist data in combination with data on dropout rates and/or study progress. In Chapter

8, the combined data set includes learning and motivation, interactionalist, and study progress data.

3.2.1 Interactionalist data

The response to the transition monitor for 2008–2009 was 30%. Regarding individual background characteristics, the respondent groups were generally representative of the overall population of full-time first year students who enrolled in higher vocational education for the first time and who had graduated from secondary education in the same year or at most one year before enrolment (Table 3.2).

Table 3.2. Interactionalist Data by Gender, Prior Education, and Sector

	Population 2008–2009	Sample 2008–2009
Women	51%	60%
Men	49%	40%
SGE	46%	53%
PUE	10%	11%
SSVE	33%	31%
Other	7%	6%
Economy	43%	41%
Health care	10%	12%
Social studies	11%	15%
Engineering (incl. Technology)	18%	15%
Education	11%	13%
Arts	2%	2%
Agriculture & Cattle Breeding	5%	2%
Total	17.346	5.819

Source: http://www.hbo.nl/hbo-raad/feiten-en-cijfers/cat_view/60-feiten-en-cijfers/63-onderwijs/74-instroom. Percentages are based on data downloaded 9 July 2012.

The focus of the questionnaire was students' degree of preparation in active learning and academic knowledge and skills during their secondary education, satisfaction during the first year regarding active learning and academic knowledge and skills, social and academic integration, and intentions to stay, switch, or leave (Kamphorst & Jansen, 2009). An overview of the interactionalist variables for this dissertation is included in Appendix C.

3.2.2 Motivation and learning data

The motivation and learning questionnaire was administered to first-year students in three institutions who also had participated in the transition questionnaire in 2006–2007 and 2008–2009. These students received an e-mail with a link to an online questionnaire, nine months after they started in the first year. The questionnaire asked them to reflect on aspects of their motivation and learning strategies, as well as their self-perceptions of their actual level of competence. These data were representative of the wider population (Table 3.3).

Table 3.3. Motivation and Learning Data by Gender, Prior Education, and Sector

	2006–2007		2008–2009	
	Population	Sample	Population	Sample
Women	51%	59%	62%	67%
Men	49%	41%	38%	33%
Havo	53%	65%	55%	51%
Vwo	7%	8%	10%	13%
Mbo	28%	16%	29%	30%
Other	12%	11%	6%	6%
Economy	44%	35%	44%	40%
Health care	16%	24%	13%	19%
Social studies	9%	8%	15%	17%
Engineering (incl. Technology)	16%	14%	13%	16%
Education	13%	11%	13%	5%
Arts	3%	7%	2%	3%
Total	3.574	894	3.612	788

3.2.3 Academic success data

The academic success data referred to dropout rates, study progress, and perceived competence. The dropout data were reliable without any constraints, in that they were controlled by external accountants and provided the basis for determining the financial budgets assigned to institutions by the MOCW. In contrast, the quality of the study progress data suffered, because institutions are not obliged to keep records of the number of credits attained by students. Reliable study progress information is more often available on an individual level, appropriate for use by students, counsellors, teachers, and coordinators. Aggregated information about cohorts of student on an institutional level is scarce. Furthermore, no strong (research) tradition in higher vocational education institutions exists concerning analyses of study progress and dropout data in relation to factors beyond individual characteristics, such as the type of programme (full time, dual work/study, part-time), gender, prior education, programme, or individual assessment data.

These circumstances strongly influenced the collection of academic success data for this dissertation, in that some administrations simply could not deliver adequate data. For example, it was difficult to determine whether low counts of attained credit points reflected students' poor initial study choices, such that they subsequently chose to switch or stop; their lack of capacities; or specific problems (e.g., personal, health). In some cases, it was possible to infer, from the presence of a relatively large number of attained credit points, that students had not really started in their first year but instead had enrolled as a sophomore or undergraduate. In these cases, the registration of exemptions was imperfect, and it was difficult to determine whether they referred to first-year or more advanced students. Therefore, this dissertation excludes cases from further analysis when either the number of credit points was 0 or greater than 70 or if dropout occurred before the first of December of the academic year. Similar problems with the collection of academic success data have been reported for research university education too (Van den Berg, 2002).

3.2.4 Data representativeness

The samples proved representative of their populations with regard to background characteristics such as gender, prior education, and sector. However, there may have been a bias related to academic success. In a non-response study of a student satisfaction survey in one of the six participating institutions, Kamphorst and Oostindiër (2008) show that respondents perform better than non-respondents. The participants in this non-response study partly overlapped with the respondents who provided the 2006–2007 learning and motivation data used in Chapter 3 of this dissertation. Therefore, there is good reason to anticipate that high-performing students are slightly overrepresented in the dissertation data. Further circumstantial evidence for this bias comes from Kamphorst and Jansen's (2012) investigation of a 2010–2011 'transition and first-year experience' survey: Respondents were more likely to persist into the second year, and non-respondents were more likely to drop out.

3.3 Research design and statistical analyses

As does most research from the interactionalist theory tradition, the studies in this dissertation used a cross-sectional design, also known as a 'correlational study', 'survey study', 'observational study', or 'non-experiment' (Howitt & Cramer, 2011). Cross-sectional studies take place during one period, allow researchers to look at a range of variables at the same time, and offer possibilities for inferring the relationships among the variables. Each variable is measured once for each participant. Cross-sectional designs consider groups of people, who differ in one or more variables of interest—such as level of preparation, satisfaction, or integration in this dissertation—but share other characteristics, such as prior education, gender, or sector (cf. Kerry, 2012). A cross-sectional design cannot provide conclusive answers about the relationships among variables. However, the correlational analyses supported by this design may provide good, theory-based, causal interpretations (Howitt & Cramer, 2011). The main drawback of the cross-sectional design (and other designs) is the potential for relatively small correlations between variables. Howitt and Cramer (2011) offer several technical reasons: The internal consistency of scales or measures, as computed with Cronbach's alpha, limits the maximum value of correlations, and the restricted variation of scores reduces the correlation between variables. The Discussion section of Chapter 9 addresses these issues.

Arguably, other designs would not have been more appropriate for this dissertation though. Chapter 2 highlighted how in interactionalist models, students' characteristics develop in interaction with the institution and the programme over time. A chain of actions and reactions taking place in the course of the first year contribute to student performance and dropout rates. A longitudinal approach, with observations spread across several moments during the first year, thus might seem logical for researching transition and first-year experiences. Such an approach also is generally accepted as effective for determining causal relationships among variables. However, longitudinal designs also suffer from bias due to the Hawthorne effect, respondent survival, or relatively high performance of participants compared with non-participants (Howitt & Cramer, 2011). For example, respondents who participate as a control group in a non-response survey indicated more satisfaction than students who only participated once in the survey or in the non-response survey (Kamphorst & Oostindiër, 2008).

Finally, the data in this dissertation were analyzed using descriptive statistics, correlations, and structural equation modeling (SEM). The SEM techniques use correlations or covariances as input for testing models that consist of one or more dependent variables and a set of one or more independent and mediating variables. The advantages of SEM, compared with other correlational techniques, include its ability to reveal the nature of the multiple relationships among independent, mediating, and dependent variables in terms of cause and effect. In addition, it accounts for measurement error in the structural coefficients (Hair, Anderson, Tatham, & Black, 1992; Tabachnik & Fidell, 2007). As a third advantage, SEM helps researchers choose among several theory-based models that try to explain a phenomenon and test specific hypotheses. Furthermore, SEM allows researchers to distinguish between manifest (observed) variables and latent constructs, such that the manifest variables can serve as indicators for the latent variables.

Chapter 4 The relationship between Perceived Competence and Earned Credits in competence-based Higher Education*

Abstract

We explored how two types of study outcomes, perceived competence and earned credits, are interrelated, and influenced by self-regulation, motivation (intrinsic value and expectancy of procrastination) and deep approach to learning. The relationships between these variables were analysed in a sample of 894 first-year Dutch university students, using linear structural modeling. Results show that learning process factors play other roles in explaining perceived competence than in explaining earned credits.

Perceived competence and earned credits, as two sides of the same medal in competence-based education, are only weakly related. Furthermore, this study shows that it is most likely that perceived competence affects earned credits, but a model in which earned credits affects perceived competence as possible causal relationship was also accepted, although the relationship remains weak. The practical implication of this study is that, as long as perceived competence and the number of credits are not related, competence-based higher education will not obtain optimal effectiveness. For participants in higher education and researchers, it remains important to be aware that different learning goals may evoke different study behaviors in students, and the challenge for higher education is to align these goals.

Keywords: self-regulation; motivation; deep approach to learning; earned credits; perceived competence.

*Based on J. C. Kamphorst, W. H. A. Hofman, E. P. W. A. Jansen, & C. Terlouw (2013). The relationship between Perceived Competence and Earned Credits in competence-based Higher Education, *Assessment and Evaluation in Higher Education, 38*, 646 – 661.

4.1 Introduction

As in many other countries, Dutch universities must cope with low effectiveness figures (Dutch Inspectorate of Education, 2009). Important reasons for non-completion that are frequently distinguished are: the wrong choice for a programme in higher education; social factors, such as lack of integration and commitment; learning process factors, such as lack of motivation, self-regulation and wrong approach to learning; and lack of study skills (Covington, 2000; Eccles & Wigfield, 2002; Onderwijsraad 2008; Robbins et al., 2004; Tinto, 1993; Yorke & Longden, 2008). In this study we have a closer look at the relations between three learning process factors, with two types of study outcomes of higher education.

Kamphorst, Hofman, Jansen, and Terlouw (2009a) compared two models and concluded that learning process factors play different roles in explaining perceived competence or earned credits. I.e., intrinsic value, self-regulation, and deep approach to learning were important factors in explaining perceived competence; procrastination, self-regulation, and intrinsic value affected earned credits. In the present study, we will elaborate on this conclusion with the purpose to develop one conceptual model in which learning process factors and the two study outcomes are related. Strong direct relationships between the two study outcomes resulting from the same learning process may indicate that perceived competence is in line with earned credits. The model is tested on a sample of freshmen in a Dutch university.

4.2 Theoretical framework

Competence-based education (CBE) is an umbrella term for all teaching approaches which use competences as a starting point for determining the goals and contents of education. Many universities have introduced CBE in response to problems related to dropout and slow academic progress. Competences are related to constructivist and active learning, consisting of components such as self-regulation, intrinsic motivation and a deep approach to learning (Van der Klink, Boon, & Schlusmans, 2007). We will use the following definitions of these concepts. Self-regulation is the extent to which a person perceives him/herself as capable of exercising influence over motivation, thinking, emotions, and the behavior that is connected to these factors (Boekaerts, 1999). This capability involves that a student is aware of, and able to manage and control, his/her learning process, and knows when to use varying cognitive strategies in order to conduct a learning task (Pintrich & De Groot, 1990; Entwistle & Peterson, 2004). Motivation, the second concept, is what drives people to action (Eccles & Wigfield, 2002). Motivation is related to the purposes and goals, the learning intentions and challenges, the personal drives, as well as the intrinsic and extrinsic properties, of the (set of) task(s) that a student is pursuing (Hattie, 2009). Two aspects of motivation that are distinguished in the expectancy-value theory of motivation are intrinsic value and expectancy of procrastination (Eccles & Wigfield, 2002). Intrinsic value is the extent to which a person perceives a certain task as joyful, valuable, pleasant, and has interest in the task. The expectancy-aspect 'procrastination' is the personal trait or tendency of a person to delay study activities that have to be completed (Schraw, Wadkins, & Olafson, 2007). Deep approach to learning, the third concept, is the intention of a student to understand learning tasks, combined with specific learning activities (e.g., applying ideas, checking evidence, repeating, selecting, relating with previous and new knowledge, structuring) (Bruinsma, 2004; Entwistle & Peterson, 2004). These three concepts together are components of a characteristic model that Entwistle and Peterson (2004) identify as 'meaning-directed learning'.

Meaning-directed learning of students is supposed to be stimulated in CBE-based programs, because the programme contents are less fragmented compared to the more traditional curriculum in universities, and more based on authentic tasks and problems (Martens & Boekaerts, 2007). Furthermore, many studies showed that the components of meaning-directed learning have impact on academic progress (e.g., Bruinsma, 2004; Entwistle & Peterson 2004; Vermunt 2005). For example, a high degree of intrinsic value as well as a low degree of procrastination is related to study success in terms of course grades, completion of assignments, or overall achievement (e.g., Bruinsma, 2004; Eccles & Wigfield, 2002; Schraw et al., 2007). Also, a deep approach to learning has impact on learning outcomes (Entwistle & Peterson, 2004). However, Bruinsma (2004) found a negative relationship between a deep approach to learning with earned credits; whereas Vermunt (2005) found a positive influence of this variable on performance, e.g., as measured by mean exam scores. These different relationships may be caused by different definitions of study outcomes. Earning credits is more related to outperforming others and superficial, rote-level processing of information, whereas acquiring competence appeals more on one's understanding and appreciation for what is being learned, combined with more deep-level, strategic-processing of information (cf. Covington, 2000). Vermunt's (2005) domain specific learning outcomes may have been more inviting for meaning-directed learning than the number of credits in Bruinsma's (2004) study. Finally, self-regulation affects both motivation and a deep approach to learning, and thus also affects academic performance (Bruinsma, 2004; Vermunt, 2005).

In this study we distinguish between quantitative and qualitative types of study outcomes. Earned credits are a more objective, quantitative aspect, and perceived competence a more subjective, qualitative aspect of study success. This distinction is related to, although not the same as, Covington's (2000) distinction in learning/performance goals.

The hypothesized relationships between meaning-directed learning factors and study outcomes are summarized in the conceptual model (Figure 4.1).

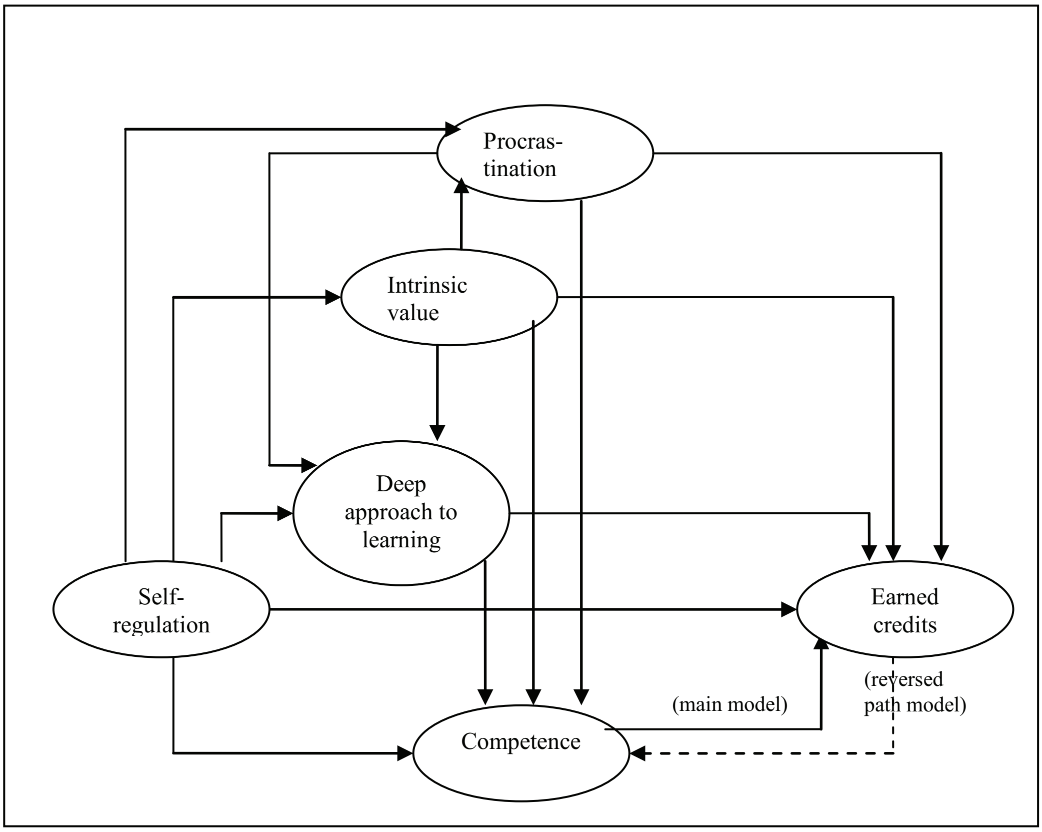


Figure 4.1. Conceptual Model

The research questions that were derived from the above are:

(1) Does the model give an adequate representation of the relations between the discussed theoretical concepts? We hypothesized that (hypothesis 1a) a high degree of self-regulation leads to higher intrinsic value and lower procrastination, and contributes to a deep approach to learning (Bruinsma, 2004; Entwistle & Peterson, 2004; Pintrich

& De Groot, 1990; Vermunt, 2005); (hypothesis 1b) meaning-directed learning will have an impact on the number of earned credits (Entwistle & Peterson, 2004; Pintrich & De Groot, 1990) as well as on competence (Covington, 2000; Pintrich 1999; Vermunt, 2005); in the cases of procrastination and deep approach to learning these influences on earned credits will be negative (Bruinsma, 2004).

(2) What is the exact nature of the relationship between earned credits and perceived competence? The relationship between the two types of outcomes is not investigated in extent (Robbins et al., 2004). In CBE, credits earned will be the result of several types of assessment: multiple choice tests, essays, self-, peer- and co-assessment (Dochy, Segers, & Sluijsmans, 1999). However, we did not have specific information on the composition of the number of credits. That is, the total number of credits conceals how many credits were awarded for mastering specific competencies, completing assignments, participation in group work, knowledge examinations or skills. We assumed that on an average, students in competence-based programmes will have a good perception of their competence. We expected a relationship between the two types of outcomes. That is, both outcomes can be traced back to the same meaning-directed learning factors (Dochy et al., 1999). The strength of this relationship will indicate how far this expectation can be confirmed. We hypothesized two possibilities (Marsh & Yeung, 1997; Phan, 2010): perceived competence influences earned credits (hypothesis 2a); the number of credits earned influences perceived competence (hypothesis 2b). Hypothesis 2a will be referred to as the main model. This model assumes that students first attain a certain level of perceived competence, which affects the number of credits earned. Hypothesis 2b, referred to as the reversed path model, is different from the main model in assuming that the number of earned credits precedes the attainment of a certain level of perceived competence.

4.3 Method

Population and sample

Data were used of first-year university students. A mail with a link to an online questionnaire was sent to 3.572 first-year students; 894 students responded by filling out and returning the questionnaire. The advantage of online data collection is that all members of the population can be reached, provided that the email-addresses used are accurate. Accuracy was guaranteed, because email-addresses were frequently used by the programmes for educational purposes, such as delivery of learning materials, assignments, feedback, and notifications of academic and social events. However, respondents of student surveys are more likely female and socially engaged (Porter & Whitcomb, 2005), as well as more committed to programme evaluations, and more satisfied with the delivery of education (Kamphorst & Oostindiër, 2008). For the sample of this study, we can conclude that female and younger students are slightly overrepresented in the sample, but in general it reflects the diversity of the population with regard to the characteristics gender, sector of the programme, and age (see Table 4.1).

Table 4.1: Background information of the sample

	Population		Sample	
Variable	No	%	No	%
Male	1768	49.5	366	40.9
Female	1804	50.5	528	59.1
< 18 years	199	5.6	74	8.3
18 -19 years	1778	50.1	558	62.8
20 – 21 years	1092	30.8	177	19.9
> 22 years	478	13.5	80	9.0
Missing	25	-	5	-
Economics	966	27.0	173	19.4
Engineering	946	26.5	214	23.9
Health care	572	16.0	216	24.2
Social studies	563	15.8	126	14.1
Arts	122	2.8	66	7.4
Education	403	11.5	99	11.1

The degree programmes of the six sectors were all competence-based. The degree programmes belong to one institution for higher vocational education, which adopted competence-based education as the leading paradigm for innovation of the curricula since about 2000. That is, all programmes are based on principles such as learning activities taking place in authentic situations, self-responsibility and self-reflection of students, and teachers' roles defined as coach and expert (Wesselink, Biemans, Mulder, & Van den Elsen, 2007). In spite of variations due to disciplinary differences (Neumann, Parry, & Becher, 2002) and different levels of implementation, the more than 60 accredited programmes in this institution reflect the general picture that higher vocational education in the Netherlands has integrated competence-based education in their curricula (Mulder, Weigel, & Collins, 2007).

Instruments

After nine months of study, first-year students were asked to look back and provide information on their learning strategies and their self-perception of competence at that moment. The data on self-regulation, intrinsic value, procrastination, deep approach to learning, and perceived competence, were captured in 36 items. All items were rated on a four-point (1–4) Likert scale, with higher scores indicating that the respective items were more applicable to the respondent. The items on self-regulation were based on a scale reported by Schwarzer and Jerusalem (1999). The items on intrinsic value, procrastination, and deep approach to learning were based on the self-report questionnaire on deep information processing (Bruinsma, 2004; Schouwenburg, 1994). Although Bruinsma's questionnaire had somewhat different theoretical roots, its items on information processing coincided with our understanding of deep approach to learning. The concept of competence consists of many dimensions (e.g., behavior–capability, knowledge-ability and specific-general) and can, accordingly, be defined in many ways (Mulder et al., 2007). In this study, we used a definition of perceived competence with a restricted range, as the self-assessed capacity to execute job tasks, independently or in cooperation with other students. Students were asked to self-assess their competence in five items. We included items such as 'together with other students I am able to solve problems that occur in this profession', and 'I already master quite some competencies of this profession'. Thus, students were allowed to have their own discipline- or profession-specific associations with each item. This generic or holistic approach (cf. Baartman & Ruijs, 2011) was appropriate to obtain an indication of the perceived competence level of a very diverse student group across different disciplines.

Based on factor analysis, with principal component analysis and varimax rotation, the five hypothesized factors were distinguished, with factor loadings varying from 0.40 to 0.80. The scales were internally consistent, with Cronbach's alphas between 0.68 and 0.88 (Table 4.2). Earned credits were measured at the end of the first year, after twelve months of study, and include credits attained after resits. The data on earned credits were obtained from the student administration. The study outcomes are registered in ECTS (European Credit Transfer System) credits. The number of credits expresses how many modules, assignments and examinations students have completed.

Students can earn 60 credits in one year. A minimum of 40 credits in the first year is required for continuation of the programme in the second year.

Table 4.2: Variables, item examples, number of items per scale, Cronbach's alpha's, means and standard deviations

Variables	Example item	N of items	Cronbach's alpha	M	SD	% positive (>2.5)
Self-regulation	I can concentrate on one activity for a long time, if necessary	7	0.83	2.64	0.46	62.2
Intrinsic value	Certain aspects of my study course are really interesting	5	0.80	3.18	0.48	91.5
Procrastination	I can't get myself down to work hard enough	12	0.88	2.32	0.47	70.1
Deep approach to learning	It is important for me that I can understand a line of reasoning and its underlying meaning	7	0.78	3.07	0.40	92.6
Competence	I have the feeling I am able to conduct some professional tasks	5	0.68	2.89	0.44	87.9
Earned credits	Credits earned during the first year	1	-	53.1	8.97	91.9[a]

[a] ≥ 40

The Table shows that the meaning-directed learning components we distinguished have been put to practice to a reasonable degree and led to satisfactory outcomes. On average, students had neutral levels of self-regulation and procrastination (means of 2.64 and 2.32, respectively), positive scores on perceived competence (mean of 2.89), as well as positive levels of intrinsic value and deep approach to learning (scores > 3.0). On average respondents earned 53 credits at the end of the first year. Enough credits (40 or more) were earned by 91.9% of the respondents.

Analysis

We wanted to test the relationships between meaning-directed learning factors, and with earned credits and perceived competence (hypothesis 1a and 1b), as well as the relationships between the two types of outcomes as hypothesized in the main and reversed path model. First, Spearman's rank correlations between the independent and dependent variables were calculated. Because correlations, or multiple regression analysis, are not informative about the causality between variables, linear structural analysis (Lisrel 8.52) was used in order to obtain a more complete picture of the causal relationships between the independent and dependent variables in terms of direct, indirect and total effects. The covariance matrix was used as input for testing two linear structural models. In answering the first research question, in both models the meaning-directed learning factors are treated as independent or mediating variables. In testing hypothesis 2a in the *main* model, perceived competence also is a mediating variable which contributes to the explanation of earned credits. In the *reversed path* model (hypothesis 2b), earned credits is treated as a mediating variable, which contributes to the explanation of perceived competence as the more distant or final outcome. The goodness of fit statistics that were used are Chi-square (with $p > 0.05$ indicating a good fit), the Root Mean Square Residual (cut-off value < 0.05), the Standardized Root Mean Square Residual (cut-off value < 0.10), the Non-normed Fit Index (cut-off value > 0.95), and the Goodness of Fit Index (cut-off value > 0.95). Along with the ´goodness of fit´ statistics the standardized residuals were inspected (values < 3 standard deviations from zero) (Jöreskog & Sörbom, 1989; Tabachnik & Fidell, 2007). The Chi-square difference test was used to test the difference between the *reversed path* model and the *main* model (Kline, 2005). The structural relationships between the latent variables are presented. Only the significant direct effects ($p < .05$) are presented.

4.4 Results

Correlations

First, the correlations between the independent variables and the dependent variables were computed (Table 4.3).

Table 4.3: Spearman's rank-correlations

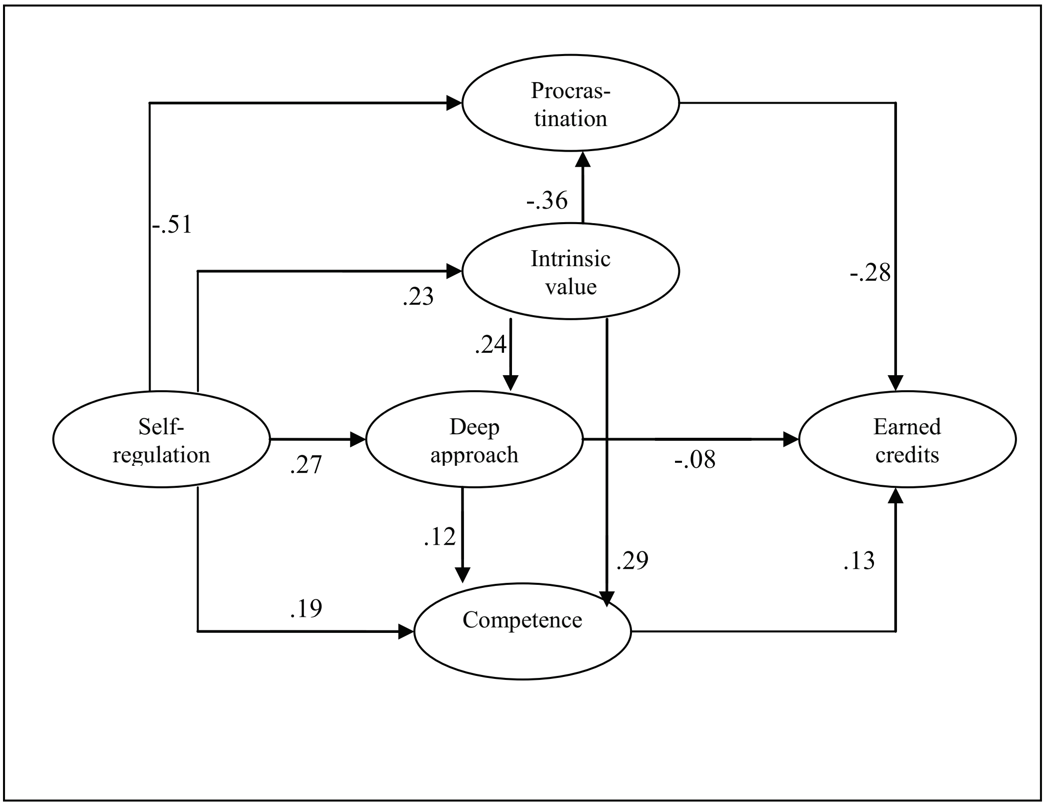
	Competence	Earned Credits
Self-regulation	0.28**	0.16**
Intrinsic value	0.35**	0.16**
Procrastination	-0.29**	-0.29**
Deep approach to learning	0.26**	0.03
Competence	1.0	0.18**

** $p < .01$, 2-tailed

The Table shows that self-regulation, intrinsic value, and deep approach to learning are stronger related to perceived competence than to earned credits (r = 0.29, 0.35, 0.26 versus r = 0.16, 0.16, 0.04). Perceived competence and earned credits are equally related to procrastination (r = -0.29 and r = -0.30). That is, students who have the tendency to postpone study activities earn fewer credits and report lower levels of perceived competence. Also, earned credits and perceived competence are significantly related (r = 0.19).

Causal relationships: the main model

The initial main model was adjusted in two respects. The paths from procrastination to deep approach to learning, and from procrastination to perceived competence were removed. The tested final main model, explaining 11% of the variance of earned credits, shows a satisfactory fit (Chi-square = 1.31, df = 4, p = 0.86; Root Mean Square Error of Approximation (RMSEA) = 0.00, 90% confidence interval 0.0–0.029; Standardized Root Mean Square Residual (SRMR) = 0.0066; Non-normed Fit Index (NNFI) = 1.01; Goodness of Fit Index (GFI) = 1.00). The standardized residuals are between -0.73 and 0.31. The path analysis resulted in a number of significant direct effects (Figure 4.2).



Note: Only the significant direct effects ($p < .05$) are presented.

Figure 4.2. Standardized Direct Effects, Main Model

The Figure shows that students with high levels of self-regulation will have a lower level of procrastination (negative direct effect = -.51), and higher levels of intrinsic value (direct effect = 0.23), deep approach to learning (direct effect = .27), and perceived competence (direct effect = 0.19). The indirect effects are calculated as the product of direct effects. For example, the indirect effect of self-regulation on perceived competence is the sum of the products of the coefficients (a) self-regulation → deep approach to learning → perceived competence (0.27 x 0.12 = 0.034), (b) self-regulation → intrinsic value → perceived competence (0.23 x 0.29 = 0.066), and (c) self-regulation → intrinsic value → deep approach to learning → perceived competence (0.23 x 0.24 x 0.12 = 0.007). Thus, the aggregate indirect effect of self-regulation on perceived competence is 0.034 + 0.066 + 0.007 = 0.11. In other words, intrinsic value and deep approach to learning act as mediators of the relationship between self-regulation and perceived competence. The sum of this indirect effect (= 0.11) and the direct effect (=0.19) is the total effect of self-regulation on perceived competence (=0.30; Table 4.4).

Table 4.4: Standardized Total and Indirect Effects for the Main Model

	Total effects					Indirect effects					Direct effects				
	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Compe-Tence	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Compe-tence	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Compe-tence
Procras-tination	-0.59	--	-0.36	--	-	-0.08	--	--	--	--	-0.51	--	-0.36	--	--
Intrinsic value	0.23	--	--	--	--	--	--	--	--	--	0.23	--	--	--	--
Deep approach	0.32	--	0.24	--	--	0.05	--	--	--	--	0.27	--	0.24	--	--
Compe-tence	0.30	--	0.32	0.12	--	0.11	--	0.03	--	--	0.19	--	0.29	0.12	--
Earned credits	0.18	-0.28	0.13	-0.06	0.13	0.18	--	0.13	0.02	--	--	-0.28	--	-0.08	0.13

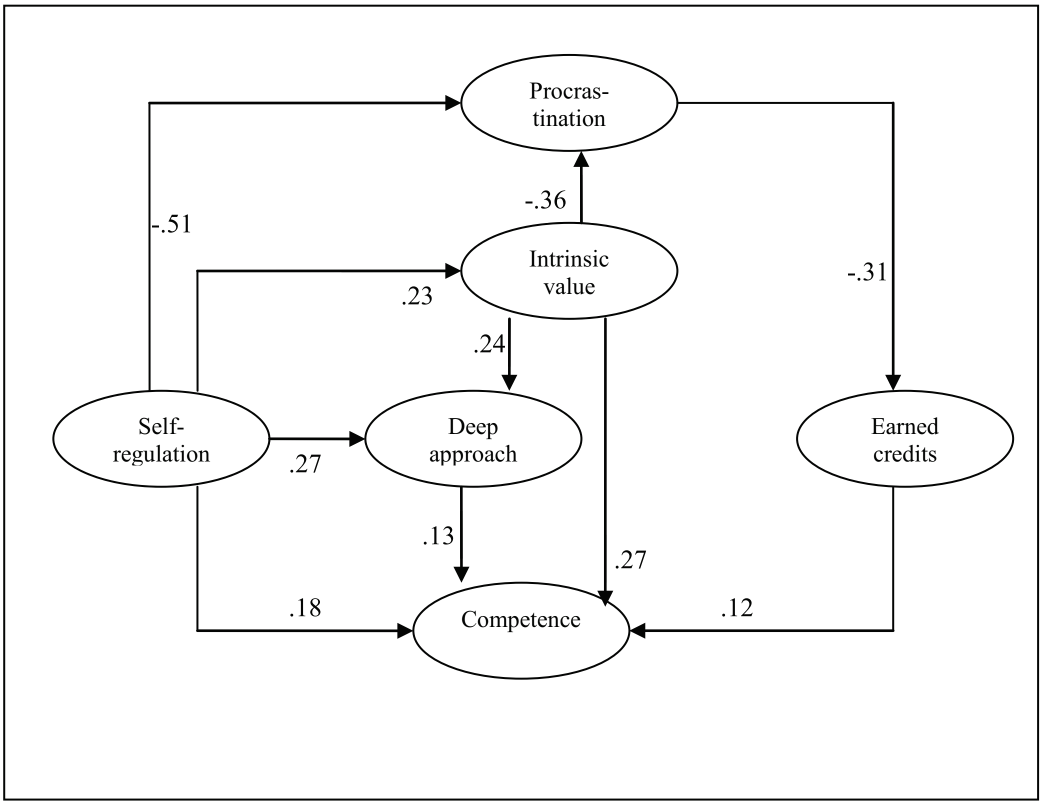
The total effects in the table show self-regulation as well as intrinsic value to have more influence on competence than deep approach to learning, whereas procrastination is not important at all.

In the same fashion, Figure 4.2 and Table 4.4 show *direct* effects of procrastination (-0.28), deep approach to learning (-0.08), and perceived competence (0.13) on earned credits. By mediation of one or more of these variables, self-regulation and intrinsic value have *indirect* effects on earned credits (values of 0.18 and 0.13). The *total* effects in the table show that procrastination has the largest influence on earned credits (total effect = -0.28). That is, the tendency to postpone study activities directly leads to fewer credits. Self-regulation, intrinsic value, and perceived competence have smaller total effects on earned credits (0.18, 0.13, and 0.13, respectively). Remarkable is the small direct negative effect of deep approach to learning on earned credits (-0.08), which is only compensated for a small part by the positive mediating effect of perceived competence (0.02), resulting in a total effect of -0.06. In sum, the total effects of self-regulation, intrinsic value, and deep approach to learning are larger on perceived competence than earned credits, and procrastination only affects earned credits.

Alternative to the main model

We changed the direction of the path between earned credits and perceived competence: the *reversed path* model. This resulted in a model with an insignificant path between deep approach to learning and credits ($p > .05$), which was therefore removed. After the two changes, the tested reversed path model did not differ significantly from the main model ($\Delta\chi^2(1$[2]$) = 2.11$, $p = .14$). Also, the fit indices of this model are still acceptable (Chi-square = 3.41, df = 5, p = 0.6367; RMSEA = 0.00, 90% confidence interval 0.0–0.039; SRMR = 0.012; NNFI = 1.00; GFI = 1.00). Therefore, the reversed path model hypothesizing that earned credits explain perceived competence is not rejected. The model explained 21% of the variance of the dependent variable. The direct effect of earned credits on perceived competence is 0.12 in this model (Figure 4.3; Table 4.5).

[2] The reversal path does not change the degrees of freedom, therefore the chi-square difference test with df = 1 is used.



Note: Only the significant effects (p < .05) are presented.

Figure 4.3. Standardized Direct Effects for the Reversed Path Model

The Figure shows that the direct effect of procrastination on earned credits is larger that in the main model and, by mediation of earned credits, exerts a negative influence on perceived competence. Other direct effects in the reversed path model only slightly differed from or remained the same as the values in the main model.

Table 4.5: Standardized Total and Indirect Effects for the Reverse Path Model

	Total effects					Indirect effects					Direct effects				
	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Earned credits	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Earned credits	Self-regu-lation	Pro-crasti-nation	Intrinsic value	Deep approach	Earned credits
Procras-tination	-0.59	--	-0.36	--	-	-0.08	--	--	--	--	-0.51	--	-0.36	--	--
Intrinsic value	0.23	--	--	--	--	--	--	--	--	--	0.23	--	--	--	--
Deep approach	0.32	--	0.24	--	--	0.05	--	--	--	--	0.27	--	0.24	--	--
Earned credits	0.18	-0.31	0.11	--	--	0.18	--	0.11	--	--	--	-0.31	--	--	--
Compe-tence	0.30	-0.04	0.31	0.13	0.12	0.12	-0.04	0.04	--	--	0.18	--	0.27	0.13	0.12

4.5 Conclusion and discussion

The first question in this paper was: ‘Does the model presented in Figure 4.1 provide an adequate representation of the relations between the theoretical concepts?’ Concerning hypothesis 1a, the accepted models show direct effects of self-regulation on deep approach to learning (Figure 4.2 and 4.3; Table 4.4), which is in line with our expectations (Bruinsma, 2004; Entwistle & Peterson, 2004; Pintrich & De Groot, 1990; Ryan & Deci, 2000; Vermunt, 2005). The positive effect of intrinsic value on deep approach to learning is in agreement with prior research (e.g., Wolters & Pintrich, 1998). Furthermore, self-regulation and intrinsic value affect procrastination. That is, students who affirm more meta-cognitive capacities and interest in their programme will show less inclination to postpone study activities (Schraw et al., 2007). Apparently, in the chain of factors explaining earned credits and/or perceived competence, self-regulation and intrinsic value precede procrastination and deep approach to learning in both models. However, in contrast with Bruinsma (2004), procrastination does not have an effect on a student’s intent to deploy a deep approach to learning. That is, the influence of this expectancy-component of motivation on deep approach, as hypothesized in Figure 4.1, is not confirmed by the two accepted models.

With regard to hypothesis 1b, meaning-directed learning affects earned credits and perceived competence, which is in line with previous research (Bruinsma, 2004; Entwistle & Peterson, 2004; Pintrich & De Groot, 1990). In accordance with Bruinsma (2004) we find that a deep approach to learning negatively affects earned credits. This result contradicts Vermunt (2005), who found a positive relationship between a deep approach to learning and earned credits. We also find that procrastination is a mediator for the influence of self-regulation and intrinsic value on earned credits. Indeed, lower levels of procrastination lead to more credits (Bruinsma, 2004). Moreover, self-regulation and intrinsic value directly affect perceived competence and have an indirect impact by mediation of a deep approach to learning (Entwistle & Peterson, 2004; Pintrich & De Groot, 1990; Vermunt 2005). Procrastination influences perceived competence directly nor indirectly.

The second question concerned the nature of the relationship between perceived competence and earned credits, and we distinguished two possible models. In the main model (hypothesis 2a) an effect of perceived competence on earned credits is confirmed (direct effect = 0.13). Students who feel (are) competent, will attain slightly more credits, although the small effect suggests that perceived competence certainly is not a necessary or sufficient condition for earning credits. The reversed path model (hypothesis 2b) showed a similar influence of earned credits on perceived competence (direct effect = 0.12). Apparently earned credits do not guarantee that students feel competent. Students, having fulfilled the requirement of the degree programme in terms of credits, will also report to feel competent, although this relationship is not very strong. The credits earned, based on what students have learned during the first year, only slightly reflect how competent they feel or are.

However, the correlation of 0.18 we found between perceived competence and earned credits is not exceptional small. For example, Hattie (2009) reports various studies which found similar low relationships between self-measures and achievement (r = 0.20). The low relationships may be due to the many overlapping or intertwining elements of which self-concepts consist, like the many fibers that make a rope in Hattie's rope-analogy. Perceived competence is just one of these elements. Likewise, standardized path coefficients of 0.08 between the independent or mediating variables and perceived competence or earned credits, indicating small influences of the mediating and independent variables on achievement, are frequently reported in other studies (Bruinsma, 2004; Valentine, DuBois, & Cooper, 2004). The reason for the stronger paths from deep learning to perceived competence, compared to earned credits, may be that these variables are based on self-perceptions. It should also be noted that self-beliefs in this study are not domain-specific. Self-estimates of ability in a specific domain, for example mathematics, will show a much stronger relationship with achievements (Baartman & Ruijs, 2011).

Apart from these considerations, there are other explanations for the rather low perceived competence-earned credits relationship on the levels of students, system, and teachers. First, *students* sense and have to cope with different incentive systems and goals that are operating in higher education. The attainment of qualitative goals, advocated by CBE as expressed in perceived competence, may be at the cost of the attainment of competing quantitative goals, such as earning credits (Covington, 2000). The findings in this study do not contradict this explanation. Students may know how to become competent (by deep approach to learning), and use their self-regulatory capacities to that purpose (in deploying deep learning, not delaying study activities), which results in earned credits. However, at the same time they may experience difficulties with competing goals of the programme ('to be competent' versus 'to earn credits, no matter if I understand everything'), and competing activities outside the programme, leading to procrastination with regard to study activities and subsequent fewer credits. The observed relatively low levels of self-regulation and procrastination, although similar to the ones found in other studies (e.g., Bruinsma & Jansen, 2007), confirm that there is still a lot to be gained in this regard.

Second, higher education *institutions* experience the discrepancy between two types of goals as they are confronted with the call from society to enable students to acquire competence in a cost-efficient way. As a consequence, institutions may feel invited to adhere to quick successes (rewards in terms of credits) and to drift away from consistency between CBE, assessment, and the qualitative goal of competence. This ambiguity may be reflected in students, when they develop an attitude of indifference towards either the goal of acquiring competence, or earning credits as a prerequisite for their diploma, or even both.

Third, *teachers* in competence-based education are coaches of their students, who have to work independently or in groups. This coaching role may be at odds with their specific academic or professional backgrounds, and this explains criticisms that the knowledge component in CBE-based higher vocational education receives too little attention (cf. Mulder et al., 2007). Teachers may prefer to give up the coaching role and reduce competence to isolated knowledge or skills of their discipline, which is reflected in the type of examinations. This restricted approach to assessment may be an invitation to students to stick to rote learning of factual knowledge and demonstration of skills, and is at odds with the emphasis on competence in the concept of CBE. In sum, on all levels the participants of higher education may not know how to handle with the different measures for study outcomes. It seems that the attained system of assessment differs from the implemented as well as the intended system of assessment in competence-based education (cf. Van den Akker, 2003).

Further research is needed to determine the interplay between perceived competence and earned credits. The confirmation of the main model as well as the reversed path model strongly suggests the existence of a reciprocal-effects model (Marsh & Yeung, 1997). The cross-sectional design of the present study was not appropriate for analyzing this reciprocal relationship. Marsh and Yeung (1997) proposed an approach with at least at two moments measures of competence (general and domain-specific) and achievement, enabling to determine developmental change over time. Indeed, using a longitudinal design, Phan (2010) showed that competence and earned credits are related over time. Furthermore, the conceptual model of this study could be extended with background characteristics, social factors, and study skills (cf. Robbins et al., 2004). Because self-regulation only partially explains study success, external regulation factors on the level of course, organization, or grant system could be included in the model (Jansen, 2004; Van den Berg & Hofman 2005). Also, students' self-assessment skills are sometimes reported to be limited, resulting in overestimation of their perceived competence (Baartman & Ruijs, 2011; Lew, Alwis, & Schmidt, 2009). It would have been interesting to use a more differentiated measurement of competence, based on the forms of assessments that are currently used in the practice of competence-based education (Dochy et al., 1999).

What could be the practical implications of the results of this study? Students are agents of the outcomes of their learning process. Although influences may seem fairly modest, perceived competence seems relevant for achievement, as achievement seems relevant for perceived competence. These results support that CBE policy addresses both types of goals (cf. Valentine et al., 2004). Making students aware of their self-regulation and motivational beliefs and behavior, may help them to become better motivated, for example by setting the right goals, and use a deep approach to learning. Self-regulation and study skills (Robbins et al., 2004; Schunk & Ertmer, 2000), a deep approach to learning (Entwistle & Peterson, 2004) and motivation (Eccles & Wigfield, 2002; Ryan & Deci, 2000) are important factors which can be influenced. Being aware that a deep approach to learning does not necessarily lead to more credits, and that perceived competence is not the same as credits awarded by current assessment systems, may help students to become more efficient learners. For all participants in higher education and researchers it remains important to be aware that different learning objectives may evoke different study behaviors in students. Therefore, the transparency of learning objectives and the communication of expected learning behavior to students is indispensable. The challenge for higher education is to influence the learning process in support of the attainment of different learning objectives.

Chapter 5 Motivational Beliefs, Learning, and Study Progress: Do Minority and Majority Students Differ?*

Abstract

The authors compare the influence of six motivational beliefs and deep approaches to learning on study progress among ethnic minority and majority students. Minority students experience a higher level of anxiety and attain fewer credits than majority students. Linear structural modeling indicates that self-confidence is the chief factor explaining the study progress of the two groups. Self-efficacy slightly affects minority students' study progress. Procrastination is only important for majority students, whereas value affects minority students' study progress. For both groups, anxiety, a deep approach to learning and self-regulation do not affect study progress. The results support the idea that it is important for educators to foster self-confidence, providing challenging tasks, giving appropriate feedback, and contacting significant others of minority students in order to positively influence their study progress.

Keywords: motivational beliefs, deep approach to learning, higher education, ethnic differences, study progress

5.1 Introduction

Attaining a degree in higher education is important for an individual's job career and future socio-economic status. In OECD countries students with an immigrant and ethnic minority background are less successful in completing secondary education, and when they manage to enroll into higher education they are also performing less well (OECD, 2011). Furthermore, minority students who graduate are less successful in finding corresponding employment. However, when minority students have a successful career in higher education and attain a degree, this may help to increase their chances on a societal success and reduce the opportunity gap with majority students. Research on how minority students learn,

*Based on J. C. Kamphorst, W. H. A. Hofman, E. P. W. A. Jansen, & C. Terlouw. Motivational Beliefs, Learning, and Study Progress: Do Minority and Majority Students Differ? Manuscript submitted for publication.

and whether they use successful learning approaches in higher education may help to reduce this gap. Minority and majority students can differ in this regard. Kember (1996) noticed Hong Kong, Chinese or Asian students to employ a learning approach which, paradoxically, combined understanding and memorizing. In the literature Kember refers to, the memorization part led to the assumption that these students might be surface learners, which should result in less academic performance. Yet, Kember's students were high achievers. One might wonder what would happen with these students if they had been studying in a Western higher education institution with an emphasis on a deep approach to learning. Would they encounter barriers for learning due to discouragement of their preferred, cultural rooted approach to learning, and might this lead to under-performance? In a similar vein, we examined in this paper whether differences exist between minority and majority students in Dutch higher vocational education and whether these differences put minority students unintentionally at a distance.

5.2 Theoretical framework

Minority students in Dutch higher education receive lower grades, earn fewer credits, exhibit higher dropout rates, and have lower completion rates than majority students (Beekhoven, De Jong, & Van Hout, 2003; Hofman & Van den Berg, 2003; Meeuwisse, Severiens & Born, 2009; Severiens & Wolff, 2009; Van den Berg & Hofman, 2005). Research in other Western countries has reported similar problems for minorities in higher education (e.g., Broecke & Nichols, 2007; Ishitani, 2007; Richardson, 2008).

Such research has suggested a variety of explanations for minority students' relatively poor performance in higher education: They experience feelings of isolation in predominantly white institutions, in which staff, mentors, and peers have different economic and cultural backgrounds (Connors, Tyers, Modood, & Hillage, 2004; Nora & Cabrera, 1996). In addition, minority poor performers, more than others, are insufficiently prepared, experience low parental expectations, have lower aspiration levels, lack a sense of belonging and support from teachers, sense a hostile climate, and pick up subtle indications of lower institutional expectations toward them (Hurtado & Carter, 1997; Severiens & Wolff, 2009; Tinto, 2012). However, other studies have suggested that minority and majority students are similar with regard to engagement (e.g., learning from other students, participation in tutorials) and integration, and these factors are only weakly associated with lack of academic success of minority students (Richardson, 2008; Severiens & Wolff, 2008). Thus, examining other factors may lead to better explanations of ethnic differences of academic success.

The focus of this study is on learning and motivation patterns as more nuanced explanations for minority students' poor performance in higher education. Minority students in higher education may be less effective learners because they have lower levels of intrinsic motivation, self-efficacy, and self-confidence than majority students (Allen, 1992; Beekhoven et al., 2003; Harper & Quaye, 2009; Richardson, 2008; Steele, 1997; Tinto, 2012). Severiens, Wolff, and Rezai (2006) suggest that minority students might drop out more in traditional learning environments because they lack external regulation and perform better in innovative learning environments that place less emphasis on knowledge transfer and more on active learning. Moreover, minority students might lack self-confidence in their academic performance due to the social climate or their negative experiences in predominantly white colleges (Allen, 1992).

Our focus on how psychological factors work provides educators and minority students with starting points to improve learning processes and odds of academic success. To do so, we compared minority and majority students' ratings on six motivational beliefs and one learning strategy—a deep approach to learning—and examined whether these factors exerted differential influences on their academic success in terms of study progress.

Motivational beliefs

Six motivational beliefs (self-efficacy, anxiety, self-confidence, value, procrastination, and self-regulation) play important roles in explaining study progress. These concepts, though rooted in several different motivation theories, are all aspects of what drives students to learn, which can influence study progress. Self-efficacy is the belief in "one's capability to organize and execute the courses of action required to managing prospective situations" (Bandura, 1997, p. 2). Many studies have shown that self-efficacy is an important condition for learning and academic success.

In the research stream based on Eccles' expectancy-value theory (e.g., Eccles & Wigfield, 2002), researchers have widely examined the concepts of value, self-confidence, anxiety, and procrastination and their meaning for academic achievement. Value is the extent to which a person perceives a task as useful, relevant, and pleasant (Ryan & Deci, 2000), which causes the activity to be intrinsically motivated. Self-confidence is the extent to which students expect they will be successful in their study (McKenzie & Schweitzer, 2001). This construct resembles the concepts of "college self-efficacy" (Aguayo, Herman, Ojeda, & Flores, 2011) and "self-confidence for education" (Majer, 2009). Anxiety is the fear or worry that occurs when a student has doubts about being successful in a learning task; it is a negative predictor of academic success (Boekaerts & Niemivirta, 2000; Covington, 2000). Procrastination is defined as a person's trait or tendency to delay study activities (Lay, 1986), which is detrimental for academic performance.

Self-regulation is a central concept in self-determination theory (Ryan & Deci, 2000). It is defined as the extent to which a person shows the capacity to exert influence on his or her motivation, thought processes, and emotions and the behavior that is congruent with these factors (Boekaerts, 1999; Ryan & Deci, 2000). Although we define self-regulation here as a motivational belief, it differs from other motivational beliefs, in that it comes closer to a deep approach to learning and also can be regarded as a (meta-)cognitive strategy.

Learning strategy

We define a *deep approach to learning* as a student's intention to understand learning tasks, combined with specific learning activities (e.g., applying ideas, checking evidence, repeating, selecting, relating with previous and new knowledge, structuring) (Entwistle & Peterson, 2004). Researchers have found that a deep approach to learning has a positive impact on learning outcomes (Entwistle & Peterson, 2004; Pintrich & De Groot, 1990; Vermunt, 2005), though some studies did not indicate a clear relationship between a deep approach and learning outcomes (Reason, Cox, McIntosh, & Terenzini, 2010).

Relationships between motivational beliefs, learning, and study progress

Many researchers have shown that motivational beliefs and a deep approach to learning influence study progress (e.g., Covington, 2000; Entwistle & Peterson, 2004; Pintrich, 1999; Ryan & Deci, 2000). Figure 5.1 presents a conceptual model of the relationships.

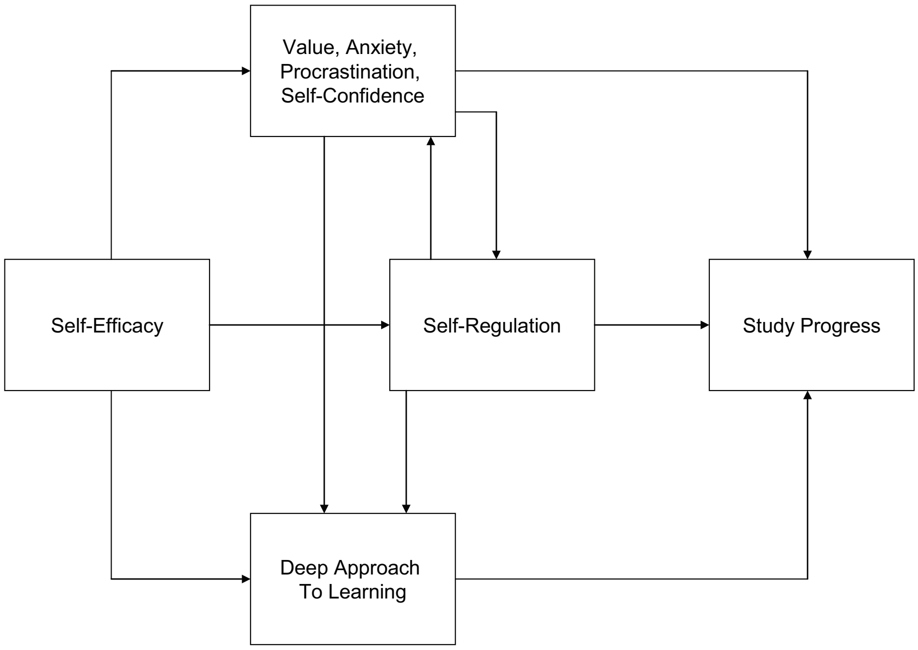


Figure 5.1: Conceptual model: Relationships among Motivational Beliefs (Self-efficacy, Value, Anxiety, Procrastination, Self-Confidence, and Self-Regulation), Deep Approach to Learning, and Earned Credits

Figure 5.1 shows that self-efficacy affects the other five motivational beliefs, deep approach to learning, and study progress (Bandura, 1994; Bouffard-Bouchard, Parent, & Larivée, 1991; Pajares, 1997; Schwarzer & Jerusalem, 2000; Schraw et al., 2007); in other words, the five motivational beliefs and a deep approach to learning are mediators of the effect of self-efficacy on study progress (Beekhoven et al., 2003; Boekaerts & Niemivirta, 2000; Bruinsma, 2004; Covington, 2000; Eccles & Wigfield, 2002; Majer, 2009; Schraw et al., 2007). The figure shows that not just self-efficacy but also other motivational beliefs affect students' deep approach to learning. For example, value and self-regulation positively affect the use of a deep approach to learning (Entwistle & Peterson, 2004; Vermunt, 2005). Furthermore, self-regulation has reciprocal relationships with several other motivational beliefs: Higher levels of value and self-confidence lead to more self-regulation, and self-regulation influences these motivational beliefs (Boekaerts, 1999; Pintrich & De Groot, 1990; Wolters, 2011). The focus of this study, however, is on how self-efficacy affects study progress through the mediation of motivational beliefs and a deep approach to learning and whether these relationships apply equally to minority and majority students.

Motivational beliefs and learning explaining ethnic differences in study progress

Previous research has suggested that factors related to ethnic differences in motivational beliefs and learning explain why ethnic minority students perform less effectively than majority students (Aguayo et al., 2011; Allen, 1992; Beekhoven et al., 2003; Harper & Quaye, 2009; Severiens et al., 2006; Steele, 1997; Tinto, 2012). Minority college students showed less intrinsic motivation than other students (National Center for Educational Studies, 2000). Students of some minority subgroups may be less intrinsically motivated than other students (Hofman & Van den Berg, 2003). Antonio (2004) reports higher self-confidence among white students. In Richardson's (2008) study, the self-confidence of Asian British and Asian students was higher than that of other ethnic categories. Steele (1997) notes minorities' stereotypical low perceptions of self-efficacy, feelings of inferiority, and low expectations as explanations for ethnic differences in success. Majer (2009) finds that self-efficacy significantly predicts an increase in cumulative grade point average among ethnic students.

Other studies, however, do not confirm or at least temper the importance of minority students' motivational beliefs for differences in academic success (Hattie, 2009; Lee, 2002; Valentine, DuBois, & Cooper, 2004). Lee (2002) finds no evidence that motivation relates to ethnic achievement gaps. Graham (1994) finds no support for the hypothesis that minority students (i.e., African Americans) have negative expectations and perceptions of their ability. They appear to maintain a belief in personal control and have high expectancies, and these beliefs were not affected by academic success. Gloria and Kurpius (2001) examine the influence of self-belief on the decisions of Native American undergraduates to drop out or switch schools. Although Native American students with higher self-esteem and higher college-related self-efficacy were more likely to persist, Gloria and Kurpius found that social factors were relatively more important predictors of persistence.

5.3 Research questions

Extant literature is indeterminate with regard to whether minority and majority students differ in their motivational beliefs and deep approach to learning, and whether these factors work in similar ways for explaining academic success across ethnic groups. Thus, in the current study, we address two research questions: First, do ethnic minority and majority students differ in their motivational beliefs, deep approach to learning, and study progress? Second, are motivational beliefs and a deep approach to learning causally related to study progress for both groups in the same way? If differences in motivational beliefs and the deep approach to learning and their influence on study progress in both groups are confirmed, it is important for universities and educators—having adopted constructivist principles of active learning and teaching in which deep approaches to learning in association with motivational beliefs such as self-efficacy, self-regulation, and value are important—to take these outcomes into account and vary their approaches for different groups of students. Alternatively, if there are no differences between groups in mean scores or influences on study progress, universities and educators can foster motivational beliefs and a deep approach to learning the same way for all students.

5.4 Method

Population and sample

We used data from first-year university students of three Universities of Applied Sciences (UASs) in the Netherlands. Three months before the end of the first year, an online questionnaire on learning and motivation was administered to a pool of 3,072 students who previously participated in a first-year experience survey. Due to the end-of-semester examination commitments, only 786 students responded to this questionnaire (response = 25.6%); 654 (21.3%) completed the questionnaire and were used in further analysis. After the academic year end, the student administrations provided information on the number of credits participants attained during the first year. Then, we merged the data on learning and motivation and earned credits. Before any further analysis, we made the data anonymous.

We used a self-definition of ethnicity. Previous research has indicated that this is a valid method to distinguish ethnic minority from majority student groups (Beekhoven et al., 2003; Connor et al., 2004). If students considered themselves Dutch, we assigned them to the majority group. We assigned students to the ethnic subsample if they considered themselves to belong to an ethnic group (63 respondents) or to be both Dutch and belong to an ethnic group (71 respondents). The final sample used in the analysis consisted of 105 minority and 549 majority students. Multivariate analysis of variance showed that the minority group did not differ from the mixed minority/Dutch group with regard to motivational beliefs, deep approach to learning, or study progress ($p > .05$). Therefore, we combined these two groups in the subsequent analysis.

The background characteristics of the respondents matched the diversity of first-year students in the three institutions, though women, younger students, and high performers (in terms of earned credits) were slightly overrepresented. The sample consisted of 32% men and 68% women, enrolled in economics (40%); health care, social studies, and education (together 42%); engineering (16%); or the arts (2%). With regard to preparation for higher education, 67% of the majority group and 57% of the minority group followed one of two pre-university tracks, and 29% and 28%, respectively, followed a vocational track. Minority students entered through an assessment more frequently than majority students (15% versus 4%), in most cases because they completed their secondary education in another country. The average age was 18 years, 10 months, in the majority group and 19 years, 5 months, for the minority group. Furthermore, the groups were similar with regard to their parents' educational level: 32% of the fathers and 28% of the mothers completed a higher education programme. On average, 70% of the students were the first generation in higher education from their families.

We did not have information about countries or cultures of origin of minority students in the sample. However, the majority of these students originated in a Turkish, Moroccan, and Surinam/Antillean culture, and a "miscellaneous" category more frequently consisted of students of Mediterranean, Asian, or African descent. These students' relatives came to the Netherlands as immigrants on a more or less voluntary basis, for reasons of work, political or religious freedom, or further education (Ogbu & Simons, 1998).

Data collection and variables

An online questionnaire was administered among first-year students. Respondents indicated their perceptions about 49 items involving self-efficacy, anxiety, self-confidence, value, procrastination, self-regulation, and deep approach to learning on four-point Likert scales (1 = "not applicable at all"/"not at all true," and 4 = "completely applicable"/"completely true").

We based the self-efficacy items on Schwarzer and Jerusalem's (2000) general self-efficacy scale. The items for value, anxiety, procrastination, and deep approach to learning came from a self-reported questionnaire on motivation and deep information processing (Bruinsma 2004; De Raad, & Schouwenburg, 1996). Although Bruinsma's questionnaire had somewhat different theoretical roots, its information processing items coincided with our understanding of a deep approach to learning. However, we excluded some items from the original scales that did not fit with the context of higher vocational education. For example, the formulation "When I read a difficult text I attentively and critically look at the argumentation" was too academic in the context of this study. For the same reason, we added some items. For example, we added "This programme is the road to the right profession for me" to the value scale. Finally, we based the self-regulation items on a scale reported by Schwarzer, Diehl, and Schmitz (1999). Before further analysis, we reverse-coded the items related to anxiety and procrastination: Low scores indicate a high degree and high scores indicate a low degree of anxiety and procrastination.

We conducted principal components analysis with unweighted least squares and Varimax rotation on the 45 items. We followed Tabachnik and Fidell's (2007) advice for interpreting the results: Eigenvalues had to be greater than 1 and factor loadings had to be larger than .40. The seven components resulting from this analysis explained 53% of the total variance. The factor loadings for five items were too low, so we excluded them from the scale calculation. Table 5.1 summarizes the resulting scales, and Appendix B presents all scale items.

Table 5.1: Variables, Number of Items per Scale, and Cronbach's Alpha

	Number of Items	Cronbach's Alpha
Self-efficacy	8	.87
Value	5	.81
Anxiety	7	.83
Procrastination	6	.82
Self-confidence	5	.73
Self-regulation	6	.82
Deep approach to learning	6	.73

The student administrations of the three institutions provided information on the number of credits students attained. Unlike higher learning institutions in other countries, students who enroll into the first year of Dutch UASs begin in discipline-specific programs. Later in their career, during the senior years of the four-year bachelor's degree programme (equivalent to 240 credits), students have the opportunity to complete one or more minors. The consequence of this structure of the curriculum is that all students must complete 60 credits during the first year. They do not have electives. If they attain between 40 or 48 credits, they are allowed to continue into the second year, under the condition that they make up the missing credits in their sophomore year. On average, the first-year students included in the present study attained 52.2 credits.

Analysis strategy

We used multivariate analyses of variance to answer the first research question, involving differences between students belonging to the minority and majority groups. To answer the second question, dealing with minority-specific relationships between the different variables, we calculated the zero-order correlations across the seven independent/mediating variables and study progress. Then, to examine the causal character of the correlations, we performed linear structural modeling (Lisrel 8.52; Jöreskog & Sörbom, 1993) using the covariance matrices for the two groups as input for this procedure. The procedure resulted in two fit models, which adequately represented the relationships between the variables. Subsequently, we compared the extent to which these variables explained the study progress of the two groups.

We used the following goodness-of-fit statistics: chi-square (with $p > .05$ indicating a good fit), the root mean square residual (RMSR; cutoff value < .05), the standardized root mean square residual (SRMSR; cutoff value < .10), the nonnormed fit index (NNFI; cutoff value > .95), and the goodness-of-fit index (GFI; cutoff value > .95). In addition to the goodness-of-fit statistics, we examined the standardized residuals (values < 3 standard deviations from zero) (Jöreskog & Sörbom, 1993; Tabachnik & Fidell, 2007).

5.5 Results

Differences between majority and minority students

We first examined whether minority and majority students differed in motivation, learning, and study progress. The results of the multivariate analysis identified differences between minority and majority students ($F = 3.219$; $p = .001$). The partial eta squared (η^2) of .038 indicates a low association between the dependent variables and ethnicity. The univariate tests showed that the two groups differed in their level of anxiety ($F = 6.342$, $p = .012$). Minority students had an anxiety score of 2.73 (SD = .56), which is lower than the 2.87 (SD = .52) reported by majority students, indicating that minority students suffered from a higher level of anxiety than majority students. Furthermore, the two groups differed in study progress ($F = 15.211$, $p = .000$). Minority students had completed 48.31 (SD = 15.6) credits during the first year, 4.6 credits fewer than the 52.99 average (SD = 11.09) majority students completed.

Relationships of motivation, approach to learning, and study progress

Table 5.2 presents the correlations among the variables. It shows that several independent variables are related: Students who are more self-efficacious and show more self-regulation are more motivated in terms of value and self-confidence, and they exhibit less anxiety and procrastination. Moreover, anxiety, self-confidence, value, procrastination, and self-regulation are related to study progress.

Table 5.2: Zero-order Correlations between Motivational Beliefs, Deep Approach to Learning, and Study Progress

	Self-Efficacy	Anxiety	Selfcon-fidence	Value	Procras-tination	Self-regulation	Deep approach	Study progress
Self-efficacy	1							
Anxiety	.35**	1						
Self-confidence	.27**	.49**	1					
Value	.12**	.08	.19**	1				
Procrastination	.01	.15**	.25**	.16**	1			
Self-regulation	.28**	.13**	.21**	.13**	.52**	1		
Deep approach to learning	.29**	.01	.15**	.29**	.12**	.22**	1	
Study progress	-.02	.12**	.35**	.16**	.25**	.12**	.03	1

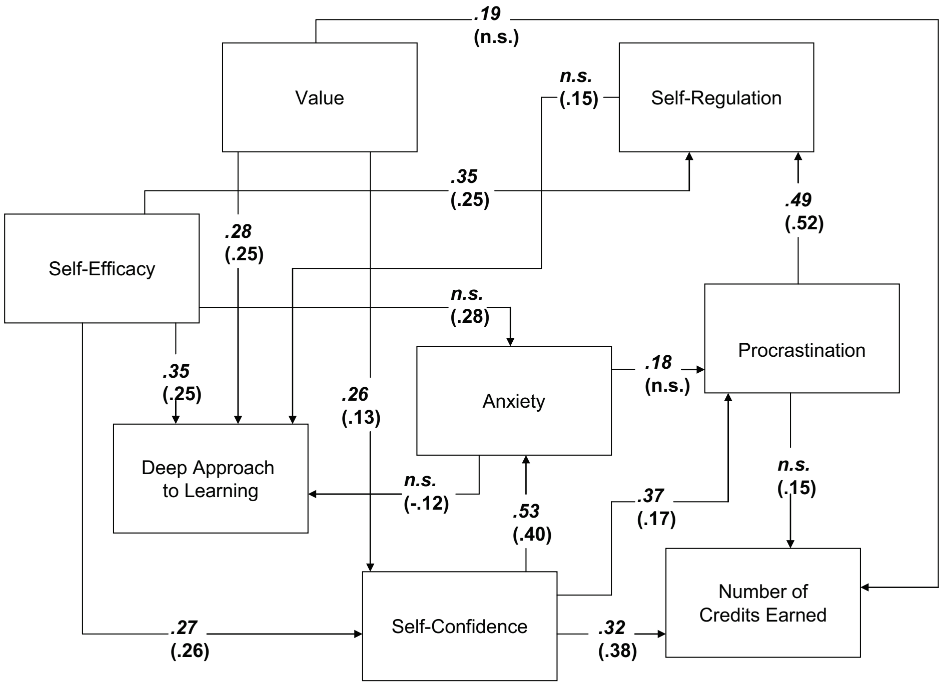
Note: Listwise deletion. $N = 654$. ** $p < .01$.

Modeling differences between minority and majority students

To answer the second research question, the degree to which study progress of minority and majority students is causally linked to motivational beliefs and deep approach to learning, we used linear structural modeling. First, we tested a model for minority students. This model achieved the following acceptable fit indices: chi-square = 8.74 (df = 15, p = .89), $RMSEA$ = .000, $NNFI$ = 1.06, $SRMR$ = 0.040, and GFI = 0.98. The model explained 17% of the variance in study progress of minority students. Likewise, we tested a model for majority students. This model also fit well with the observed data, with the following fit indices: chi-square = 13.19 (df = 12, p =.36), $RMSEA$ = .013, $NNFI$ = 1.00, $SRMR$ = .021, and GFI = .99. The model explained 28% of the variance in study progress of majority students. After testing the two models, we compared the standardized direct and total effects of the two groups.

Direct and total effects of the minority and majority models compared

Figure 5.2 displays the direct effects among the motivational beliefs variables, deep approach to learning, and study progress for the two groups.



Notes: Coefficients minority students in italic; majority students in brackets; n.s. = not significant path.

Figure 5.2: Relationships between Motivational beliefs, Deep Approach to Learning, and Earned Credits for Minority and Majority Students

We find similar patterns for the two groups with regard to the direct effects of self-efficacy on self-regulation, deep approach to learning, and self-confidence. In addition, the patterns of the two groups are similar with regard to the value → self-confidence, self-confidence → anxiety, self-confidence → procrastination, procrastination → self-regulation, and self-confidence → earned credits paths, though the effect sizes differ. For example, the path between self-confidence and procrastination is much stronger for minority students than for majority students (.37 versus .17). However, the patterns are different with regard to six paths. For minority students, value affects earned credits (.19), and anxiety affects procrastination (.18), whereas these relationship are absent for majority students. For majority students, but not for minority students, we observe that self-efficacy has a direct effect on anxiety (.28); anxiety negatively affects the deep approach to learning (–.12); self-regulation influences a deep approach to learning (.15); and procrastination affects earned credits (.15). Table 5.3 displays a comparison of direct and total effects of the variables on study progress for the two groups.

Table 5.3: Standardized Effects on Credits for Minority and Majority Students

	Direct Effects		Total Effects	
	Minority	Majority	Minority	Majority
Self-efficacy			.09	–.03
Value	.19		.27	.07
Procrastination		.18		.18
Anxiety				
Self-regulation				
Deep approach to learning				
Self-confidence	.32	.38	.32	.34

As Table 5.3 illustrates, self-confidence and value matters most for study progress of minority students, whereas self-efficacy plays a modest role. Self-confidence and (a low degree of) procrastination are the most important factors for majority students' study progress, whereas value appears relatively less important, and self-efficacy has a small negative impact. The other two motivational beliefs (anxiety and self-regulation) and a deep approach to learning do not exert significant effects on the study progress of the two groups.

5.6 Conclusion

In this study, we first addressed the question of whether minority and majority students differ in their motivation, learning, and study success. Minority and majority students differed slightly in anxiety and showed a larger difference in number of earned credits, but they had the same ratings on other motivational beliefs and a deep approach to learning.

The second research question involved the influences of self-efficacy, the other five motivational beliefs, and a deep approach to learning on study progress. The conceptual model presented in Figure 1 was only partly confirmed. Self-confidence was important for the study progress of both groups. Value and self-efficacy are important for study progress of minority students, but not for majority students, whereas procrastination was only important for majority students' study progress. Furthermore, minority and majority students slightly differed in some respects. We only found a small influence of self-regulation on the deep approach to learning for the majority group. Finally, self-regulation and a deep approach to learning did not influence earned credits for the two groups.

5.7 Discussion

In contrast with previous studies (Allen, 1992; Antonio, 2004; Beekhoven et al., 2003; Steele, 1997), we did not find that minority students have lower levels of self-efficacy, self-confidence, and value, nor did we find differences in self-regulation or a deep approach to learning. The finding that minority students had a higher anxiety level supports Steele (1997), though the difference with majority students was small. Finally, as expected, majority students earned more credits than minority students.

In some respects, the results of this study support the evidence that motivational beliefs differentially influence the study progress of different ethnic groups. Self-efficacy and value only matter for minority students' study progress, whereas procrastination influences majority students' but not minority students' study progress. However, the influences of other motivational beliefs (anxiety and self-regulation) and a deep approach to learning on study progress appear to be the same across both groups. In line with other studies (Aguayo et al., 2011; Antonio, 2004; Majer, 2009; Stankov, Lee, Luo, & Hogan, 2012), we find that self-confidence is important for the study success of minority students, as well for majority students. Moreover, in line with extant literature, we find that self-efficacy and value are related to self-regulation in both groups. In contrast with other studies (e.g., Bouffard-Bouchard et al., 1991; Entwistle & Peterson, 2004; Zimmermann & Kitsantas, 2005), self-regulation neither directly, nor by the mediation of a deep approach to learning, influences study progress. This part of the constructivist and active learning model, which is fostered in UAS, is not confirmed for first-year ethnic minority or majority students.

A possible explanation for the finding that minority and majority students are more similar than different is that the segregation levels in the Netherlands are moderate compared with other countries (Musterd, 2005). Minorities are likely to go to the same secondary schools as other students, where they are prepared the same way for higher education. This may apply even more to UAS in the northeastern part of the country, where the demographic density of minorities is relatively low. Another possible explanation for not finding differences is that minority students may have provided answers that reflect what they think their educators expect or majority students report socially biased, rather than their true, self-perceptions.

An explanation for the lacking influence of self-regulation could be that first-year students need more time to develop effective self-regulation and a deep approach to learning (Wigfield & Wagner, 2005). This could be a hypothesis for further research among students in higher years. In this regard, a longitudinal design might have been more effective. Another limitation of this study was the sample size. With a larger sample, we might have found differences in motivational beliefs and learning among minority subgroups such as Moroccan, Turkish, and Surinam/Antillean students (Aguayo et al., 2011; Hofman & Van den Berg, 2003; Majer, 2009).

5.7 Practical implications

Although this study was about minority and majority students, we focused on the first group, which is more challenged in higher education settings. However, the practical implications also likely apply to majority students. It is important for educators to reinforce minority students' self-confidence, because it is an important working factor in relation to study progress (e.g., Stankov et al., 2012). It may also be important for educators to maintain contacts with parents or other familial representatives, because they are antecedents of minority students' self-efficacy. These contacts may evoke the enthusiasm of minority students' significant others; lead to reinforcement of their feelings of self-efficacy, self-confidence, and value; and indirectly influence their academic success (Aguayo et al., 2009; Bandura, 1994; Van Dinther, Dochy, & Segers, 2011). This study also confirmed that value is a relatively important factor of minorities' success in UAS. For that reason, providing challenging tasks and giving appropriate feedback that reinforces minority students' intrinsic motivation may positively influence the study progress of this group.

Chapter 6 The Effects of Prior Education and Engagement on Success in Engineering Studies: Do Female and Male Students Differ? *

Abstract

In Dutch engineering education, female students outperform male students. Using an interactionalist framework, this study explores factors that contribute to this gender-based difference. The two questions are: (1) Do female and male students differ in background characteristics, engagement factors, or academic success? (2) Are differences in the relationships among background characteristics, engagement factors, and academic success gender specific? Samples of male and female engineering undergraduate students from five universities were subjected to linear structural modeling, to compare potential gender differences in the relationships among the focal variables.

The results show that female students spend more time in independent study, report more social integration, earn more credits, and are less likely to drop out than male students. Academic integration and intentions to persist are important for study progress in both groups. Social integration is only important for men's study progress. Female students seem to benefit less from good preparation through active learning during secondary education and the almost absent effect of a high math GPA on their study progress contrasts with the larger effect in this regard for male students.

In conclusion, interactionalist concepts are viable for explaining academic success, but the relationships among concepts vary by gender. The chilly climate for female students in engineering education has warmed; in addition, males' intentions to persist in engineering are an outcome of engagement processes during the first year, whereas females' intentions to persist in engineering are manifest at the start of the first year.

Keywords: gender, engineering education, engagement, academic success

* Based on J. C. Kamphorst, W. H. A. Hofman, E. P. W. A. Jansen &, C. Terlouw. The Effects of Prior Education and Engagement on Success in Engineering Studies: Do Female and Male Students Differ? Conditionally accepted article. Journal of Engineering Education.

6.1 Introduction

Female students in higher education programmes today outperform male students, in both numbers and academic outcomes (OECD, 2011; Shah & Burke, 1999; Van den Berg & Hofman, 2005; Vogt, Hocevar, & Hagedorn, 2007). In science, technology, engineering, and mathematics studies, where male students remain the majority, even as female students face the challenges of being a minority group, they appear to be performing better than their male peers (NCES, 2000). Quantitative and qualitative developments in engineering studies in the Netherlands confirm such international trends (OECD, 2011; Van den Berg & Hofman, 2005): Participation by females in this sector has increased from 13% to 15% between 1998 and 2005. In 2011, more than 18% of the first-year students choosing engineering as their major were females. Furthermore, 64.2% of the women who started an engineering programme in 2005 attained a diploma after five years, versus only 53.7% of the men (HBO-Raad, 2010).

Researchers have adopted various standpoints to explain these performance outcomes and gender differences in engineering education (Fox, Sonnert, & Nikiforova, 2009; Min, Zhang, Long, Anderson, & Ohland, 2011). From an individual perspective, studies consider students' initial attitudes, abilities, behaviors, skills, and previous experiences as possible influences on student attrition and gender differences (e.g., Felder & Brent, 2005; Fox et al., 2009; Jones, Paretti, Hein, & Knott, 2010). Other studies adopt an environmental perspective and include the teaching environment, classroom interactions, and academic engagement as determinants of student performance and persistence. We propose instead an interactionalist approach, which combines individual and institutional factors to explain student success and retention in higher education (Astin, 1993; Tinto, 1993). Together, these factors can determine students' study progress (i.e., credits earned) and decisions to stay in the programme after one year (Braxton, Hirschy, & McClendon, 2004; Tinto, 1993). In Figure 6.1 we depict the predicted relationships in an interactionalist model between first-year students' characteristics, engagement factors during the first year, their intention to persist, and first-year outcomes in terms of credits and the decision to continue as a sophomore.

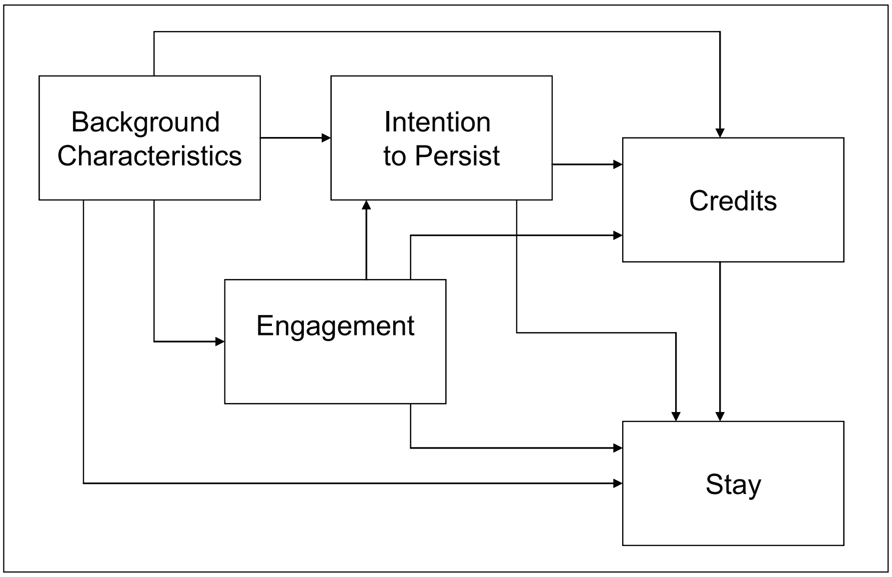


Figure 6.1: Conceptual Model

Figure 6.1 shows that students' engagement with a programme is pivotal for their intention to persist, performance level (credits) and the decision to stay in a programme. Engagement develops in interactions among peers and faculty. In Tinto's (1993) theory, social and academic integration are central elements of engagement. Other aspects of engagement which are frequently linked with integration in interactionalist approaches are students' satisfaction and the time they invest in study activities. Intention to persist forms a vital link between engagement and academic success (e.g., Cabrera, Castaneda, Nora, & Hengstler, 1992). It is distinguished, but not separate from other engagement aspects in the figure. Background characteristics, such as level of preparation in secondary education, have influence on engagement, and, directly or indirectly, students' decisions to stay.

Some relationships among the factors presented in Figure 6.1 may be specific to each gender though. For example, Griffith (2010) finds that even though female students are relatively better prepared (i.e., followed appropriate courses to pursue an engineering major), they tend to switch to another major more often than male students. In contrast, for male students the main driver of such switches is poor academic performance (Ohland, Brawner, Camacho, Layton, Long, Lord, & Washburn, 2011). Female students also leave more frequently due to their experience with and sensitivity to the "chilly climate" in engineering studies. This chilly climate refers to the persistence of male-dominated, highly impersonal, individualistic engineering learning environments (Seymour & Hewitt, 1997). When females experience lack of support, subtle discrimination, or exclusive treatment by teachers and male peers in this environment, they become less persistent in their engineering studies. If the chilly climate can be warmed though, such that female students receive encouragement through positive faculty interactions in the classroom (feedback, respectful treatment) and social activities (study groups), they are more likely to persist (Amelink & Meszaros, 2010; Hewitt & Seymour, 1991).

There are observations that, indeed, the climate in engineering education in The Netherlands is warming in the last decades due to the innovations aimed at attracting and retaining more female students in Dutch engineering programmes (Hermanussen & Booy, 2002). Also, the recent changes in secondary education may have been supportive in this regard (Tweede Fase Adviespunt, 2005). We use the interactionalist concepts of academic and social integration (Tinto, 1993) as indicators for the degree to which students experience a chilly climate.

6.2 Research questions and hypotheses

For this study, we take concepts from an interactionalist approach, such as Tinto's (1993) theory on student departure, to help explain the academic success of male and female engineering students. Because we recognize that the relationships among the concepts might not be the same for different groups (cf. Braxton et al., 2004), we address two main research questions:

(1) What are the differences between male and female engineering students with regard to their background characteristics, engagement process factors, and academic success?

We expect female students' preparation for their studies will not differ significantly from that of their male peers. First, they were in the same pipeline as male students during general secondary or secondary vocational education, and, thus, had a similar preparation in academic knowledge and skills and experience with active learning (Hermanussen & Booy, 2002; Tweede Fase Adviespunt, 2005). Second, although generally male students perform better in subjects such as Math, Science, or Chemistry, at the end of secondary education, the select group of female students who choose for engineering studies is a-typical in this regard, and therefore will have an equal or even higher math ability compared to male students (Zhang, Carini, & Kuh, 2005). Also female students should have at least the same satisfaction level as male students when it comes to active learning and social integration, as they are more cooperative learners (NCES, 2000; Severiens & Ten Dam, 1998). They should also have at least the same levels of social and academic integration because the climate is reported to have warmed (Hermanussen & Booy, 2002). Furthermore, female students should spend at least the same amount of time on independent study as male peers. We use this measure of time spent studying as an expression of student engagement. Research even shows that female students, being more independent learners than men (NCES, 2000), tend to study more on their own time, outside class (Griffith, 2010). Finally, we expect, according to current trends in education, that female engineering students outperform their male peers in the number of credits they earn and by exhibiting lower dropout rates. That is,

H1: Female students (a) have the same level of preparation for engineering studies; (b) are just as satisfied with their academic knowledge, skills, and social and academic integration; (c) spend similar amounts of time in independent study; and (d) perform better in terms of attained credits and lower dropout rates compared with their male counterparts.

In sum, acceptance of the hypotheses 1a, b, and c would indicate that female students are at least equally fulfilling the conditions of preparation and engagement. Acceptance of hypothesis H1d would indicate that females outperform males in engineering. Whether these factors are working in the educational process, and do so in a gender- specific way, is the focus of the second question.

(2) Do gender-specific differences appear in the relationships among background characteristics, engagement factors, and academic success?

We have specific expectations with regard to five relationships. First, preparation through active learning is relatively more important for female than male students' success, in line with research that highlights the importance of preparation during secondary education for success in higher education (e.g., Astin, 1997; Jansen & Suhre 2010; NCES, 2000; Torenbeek, Jansen, & Hofman, 2010; Wolniak & Engberg, 2010). Second, this influence likely is partially transferred by the extent of independent study (Geerdink, Bergen, & Dekkers, 2009; Griffith, 2010; Pascarella & Terenzini, 2005; Vogt et al., 2007). Third, academic integration, measured by good contacts with faculty, may be relatively more important for female students' attained credits and persistence (Amelink & Meszaros 2011; Geerdink et al., 2009; Seymour & Hewitt, 1997; Vogt et al., 2007; Yorke, 2000). Fourth, because female students remain a minority in male-dominated engineering programmes (Mastekaasa & Smeby, 2008), the influence of social integration on study progress and persistence instead will be lesser for them, compared with male students. Finally, intention to persist is important for both genders (Astin, 1993; Tinto, 1993).That is,

H2: When it comes to academic success, (a) active learning preparation is more significant for female than for male students, and (b) this effect is indirect through female students' level of independent study; (c) academic integration is more significant for female than for male students; but (d) social integration is more significant for male than for female students; and (e) intention to persist is equally important for the two groups.

These hypotheses are based on interactionalist as well as other studies which showed that active learning during secondary education results in good preparation, independent study behavior, and indirectly influences academic integration. In the context of improved preparation and a warmed climate, these factors might be relevant although they still may work differently for females and males. For example, social integration may continue to be an inhibiting factor for female academic success in male-dominated environments of engineering education. The possible influences of GPA math, secondary education type, preparation in knowledge and skills, and satisfaction, were not hypothesized, because the literature is not conclusive about these factors. However, as they are relevant in the Dutch debate on academic success, we also examined the influence of these factors.

6.3 Method

6.3.1. *Population and sample*

The present study is part of a project in which five institutions in the Northeastern part of The Netherlands cooperate in monitoring freshmen who are enrolled into higher education for the first time, immediately after graduating in secondary education. Three months after the start of the 2008–2009 academic year we administered an online questionnaire to 1,157 first-year engineering students attending five institutions of higher education. The five institutions, with 68,000 students in 2008, fairly represented the population of more than 300,000 full-time students in Dutch universities of applied sciences with regard to prior education, gender, and age. Concerning engineering education, we received completed responses from 353 students (response rate = 30.5%). In terms of gender (290 male respondents [82%], 63 female respondents [18%]) and educational background (222 senior general secondary education [65%], 121 senior secondary vocational education [35%]), the sample was representative of the population of engineering students in the participating institutions and also nationally (83% males, 17% females; 59% senior general secondary education, 41% senior secondary vocational education) (Kamphorst, Hofman, Jansen, & Terlouw, 2012).

In the context of this study it is important to notice that the respondents' programmes used forms of active learning. Different approaches, such as cooperative learning, project-based learning, or problem-based learning, may go under this name (cf. Prince, 2004). The introduction of active learning methods in secondary and higher education aims to increase students' engagement, in terms of satisfaction with pedagogical methods, independent learning, and academic success (Astin, 1993; Griffith, 2010; Hermanussen, & Booy, 2002; NCES, 2010; Prince, 2004).

6.3.2. *Data collection and rationale for variables*

The online questionnaire consisted of four questions about background characteristics and seven questions about engagement in the first year. The academic success variables, i.e., study progress and persistence, were collected from the student administrations.

1) *Background characteristics*: The background questions included two one-item questions about prior education and GPA in Math in secondary education, and two multi-item questions with regard to academic knowledge and skills and active learning during secondary education. Students' type of secondary education may influence their experiences with and appreciation for didactical approaches and course content, in terms of the knowledge and skills they gain in the first year, as well as their success in higher education overall. For example, Van Bragt, Bakx, Van der Sanden, & Croon (2007) reported that female students coming from senior general secondary education are more likely to be more successful in higher education. GPA in math was defined as the reported average score in math courses during the final year of secondary education. This variable offers a good predictor of both the decision to leave engineering studies at an early stage (Min et al., 2011; Moller-Wong & Eide, 1997) and study progress (Van den Berg & Hofman, 2005).

Furthermore, we distinguished between preparation in active learning and preparation in knowledge and skills (Hermanussen & Booy, 2002; Tweede Fase Adviespunt, 2005). The former is the degree to which students were actively involved in their secondary education with forms of learning such as problem analysis, working in groups, cooperating, or reflecting on their learning process. The latter refers to the amount of time students spent during their secondary education on subjects that encouraged them to be independent and self-regulated learners in higher education. Good preparation in these two respects should be relevant for success in the first year of engineering.

Respondents provided their perceived degrees of preparation in active learning and academic knowledge and skills on two lists. The fourteen items about preparation concerning academic knowledge and skills and active learning could be rated on a 5-point Likert scale which ranged from 1 ("there was no time at all for this aspect during secondary education") to 5 ("there was very much time for this aspect during secondary education").

A principal component analysis was conducted on the fourteen preparation items. This analysis resulted in two factors with eigenvalues larger than 1, explaining variances of 26% and

19%, and with substantial loadings on items representing preparation in active learning, respectively academic knowledge and skills (see rotated component matrix in Appendix C.2). The reliabilities of the preparation scales were good, with Cronbach's Alpha values of 0.84 and 0.76.

2) *Engagement*: Engagement is a catch-all term for the degree of students' involvement in a programme (cf. Astin, 1993). We measured time spent on study, satisfaction with active learning, satisfaction with knowledge and skills, integration, and intentions to persist (Carroll, 1963; Chickering & Gamson, 1987; Pascarella & Terenzini, 2005). Time spent on study consists of (scheduled) contact hours, or the time students spend in classes in the presence of teachers, as well as independent study, or the time students spend on assignments, homework, and preparation for examinations, outside the presence of teachers. This dual measure of time spent on study should be an important explanatory factor for academic success (Carroll, 1963), though several authors discover no influence of contact hours on study progress (Slavin, 1995; Van den Berg & Hofman, 2005), suggesting more relevance for independent study (Schmidt, Cohen-Schotanus, Van der Molen, Splinter, Bulte, Holdrinet, & Van Rossum, 2009). Thus, the two questions about time spent on study were about the time invested in contact hours and independent study.

Respondents were also asked their opinion about active learning and academic knowledge and skills in the first year in fourteen items as well as integration in seven items. For the same aspects as in the two questions about preparation, respondents could indicate their satisfaction on a Likert scale which ranged from 1 ("very low") to 6 ("very high"). We distinguished social integration, or contacts by students with other students, from academic integration, which refers to contacts of students with teachers (Tinto, 1993). We interpreted lower or higher levels of social and academic integration as indications of the presence or absence of a chilly climate in their first year of study. The specific items came from scales developed by Beekhoven et al. (2002). The Likert-like integration-items could be rated from 1 ("very dissatisfied") to 5 ("very satisfied"). We conducted principal component analysis with unweighted least squares and Varimax rotation on the twenty-one items concerning first-year experiences in terms of satisfaction and integration. Using as decision rules that eigenvalues had to be at least 1 and factor loadings had to be larger than .40 (items with factor loading less than or equal to .40 were discounted; Tabachnik & Fidell, 2007), four factors emerged, jointly explaining 58% of the total variance. Factor 1 explained 19% of the variance, and showed substantial loadings on six items related to satisfaction with active learning. Factor 2 explained 16% of the variance, with substantial loadings on eight items formulated for satisfaction with academic knowledge and skills. Factor 3 explained 13% of the variance, with large enough loadings on four items indicating quality of contacts with peers. Factor 4 explained 10% of the variance, with loadings on three items related to academic integration. The rotated component matrix is presented in Appendix C.1. The reliabilities of the four scales were good, with Cronbach's Alpha values between 0.87 and 0.73.

Finally, we included one question about intention to persist. Many interactionalist studies cite this factor (or its equivalents) as a significant predictor of academic success (e.g., Astin, 1993; Braxton et al., 2004; Cabrera et al., 1992). We defined 'intention to persist' as the consideration to choose the same engineering programme if students were asked to choose again. This definition is different from Tinto's (1993) intention to persist in college. In our definition, intention to persist is related to the specific programme students enrolled in, i.e. engineering. Thus, students were asked if they might, after three months in the programme, go the same engineering programme and institution, prefer another programme and/or institution in higher vocational education study, another type of further schooling, or work. Of the 342 respondents, 284 (83%) stated that they might choose the same specific engineering programme. Of the 58 students (17%) who considered an alternative, one third might choose another programme within the same institution, one third might do a similar programme at another institution, and one third might do another programme at another institution or leave college and rather work.

3) *Academic success*: We regarded study progress, defined as the number of credits earned during the first year, and continuation (persistence) into the second year, or 'stay', as two indicators of academic success. Although strictly speaking, academic success involves more than study progress and 'stay' tendencies (Terenzini & Pascarella, 2005), in prior interactionalist approaches, these two variables frequently serve as indicators of success (Braxton et al., 2000; Tinto, 1993). At the end of the first year, after closure of the deadline for exams, resits and assignments, the student administration provided information on each student's number of credits and whether he or she stayed in the programme. Different from other colleges (e.g., North-America), where programmes of the first year are fairly wide and have contents which are not-discipline specific, 'credits' in the context of this study are engineering credits, earned by students after meeting all course requirements. On average the first-year engineering programme consists of twenty courses to a total of 60 credits, equal to an annual workload of 1680 hours. Generally, no electives are taken during the first year. Once a student is in the first year of engineering, it is hard to conceive in the Dutch system that he/she takes other credits during the academic year, even when transfer from the programme is

considered. A bachelor degree in engineering is earned with 240 credits. Before any further analysis, these data were made anonymous.

6.3.3 *Variables in the study*

In sum, we used thirteen variables in this study, as we show in Table 6.1.

Table 6.1: Study Variables

Variable	Description and response scales	Number of Items	Cronbach's Alpha	Mean	SD
Background characteristics					
1. Secondary education	0 = senior general (SGE)	1	-	.63	.48
	1 = senior vocational (SSVE)			.37	.48
2. Math GPA [1]	1 = low, 10 = high	1	-	6.91	.97
3. Preparation of active learning skills	Degree of preparation of active learning skills during secondary education, 1 = low, 5 = high	6	0.84	2.64	.68
4. Preparation of academic knowledge & skills	Degree of preparation of academic knowledge and skills during secondary education, 1 = low, 5 = high	8	0.76	3.09	.55
Engagement factors					
5. Contact hours	1–40 per week	1	-	19.75	8.87
6. Independent study hours	1–50 per week	1	-	12.67	7.62
7. Satisfaction with active learning	Satisfaction with education in the first year related to active learning skills, 1 = low, 6 = high	6	0.87	3.77	.73
8. Satisfaction with academic knowledge & skills	Satisfaction with education in the first year related to academic knowledge & skills, 1 = low, 6 = high	8	0.84	4.00	.57

Variable	Description and response scales	Number of Items	Cronbach's Alpha	Mean	SD
9. Social integration	Satisfaction with contacts with other students in the programme, 1 = low, 5 = high	4	0.84	4.12	.60
10. Academic integration	Satisfaction with contacts with faculty and learning environment, 1 = low, 5 = high	3	0.73	3.68	.76
11. Intention to persist	0 = no	1	-	.17	.38
	1 = yes			.83	.38
Academic success					
12. Credits[2]	1–69	1	-	47.03	15.3
13. Stay	0 = leave	1	-	.21	.41
	1 = stay			.79	.41

Notes. 1. In the Netherlands, marks are based on a 1-10 scale. A '6' is fair or (just below) average, best compared with B, B- or C in the American system. The equivalent of '7' (just above average) would be A- or B+, and '7.5' (good) or higher would be 'A-, A, or A+'. Lower than '6' is poor, which means a student does not pass an exam. 2. One credit is equivalent to a study load of 28 hours.

The Table shows that about two-thirds (63%) of the respondents entered their university after five years of *senior general secondary education* (SGE). This group averaged 17 years of age when they enrolled. One-third (37%) completed four junior years, followed by four years of *senior secondary vocational education* (SSVE), and were about 20 years of age on entry. The respondents reported an average GPA of 6.91 for mathematics in the year before their entry into higher education engineering studies.

With regard to engagement, the students in our study spent an average 20 hours in contact time and 13 hours in independent study each week. They largely expressed their satisfaction with active learning and academic knowledge and skills, with scores of 3.73 and 4.0 on the two scales. However, they were satisfied with their level of academic integration with a 3.68 and even more satisfied with their social integration with a 4.12. On average, students attained 47 credits in their first year, and 21% of the students dropped out of the programme.

6.3.4 *Analysis*

To answer the first research question, we compared the mean scores provided by male and female respondents on all 13 variables and calculated Cohen's d, for which effect sizes of 0.20–0.30 indicate small effects, around 0.5 indicate medium effects, and greater than 0.8 are large effects (Cohen, 1988). For the second research question, we first calculated the correlations and covariances. Then the covariance matrix served as input for the linear structural analysis (LISREL 8.52; Jöreskog & Sörbom, 1993). Model variation and variable constraints made the specification of the two samples in a multi-sample analysis difficult. Following Bentler (1995; Vogt et al., 2007), we decided to develop the linear structural models for the two subsamples separately and defined paths between variables with significant correlations. The initial structural models did not fit, but after a few adaptations, the two models fit the empirical data acceptably. We assessed the fit of the models using the following measures: chi-square, standardized root mean square residuals (SRMR), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and standardized residuals (Jöreskog & Sörbom, 1993; Tabachnik & Fidell, 2007). A comparison of the fit indices with their desired cut-off values (Hu & Bentler, 1999; Jöreskog & Sörbom, 1993) indicated a good fit for both models (Table 6.2). The percentages explained variance in the models were 20% for earned credits and 50% for stay for male students, respectively 32% and 12% for female students. We reported *direct* effects, i.e., the significant ($p < .05$) structural path coefficients between pairs of variables, as well as *total* effects, i.e., the structural coefficients which express the causal effect of independent or mediating variables on a dependent variable when controlled for other variables in the model.

Table 6.2: Fit Indices for the Two Models

	Males	Females
Chi-square, *p*-value and degrees of freedom (cut-off value $p > 0.05$)	46.84, $p = 0.60$, df = 50	35.97, $p = 0.97$, df = 53
RMSEA (cut-off value < 0.10).	0.00	0.00
SRMR (cut-off value < 0.08)	0.042	0.075
GFI (values between 0.9–1.0 indicate good fit)	0.97	0.91
Standardized residuals (cut-off values < ±2.58)	-1.55 to +2.33	-1.70 to +1.51

6.4 Results

6.4.1 *Means*

With regard to our first research question, the results confirm our hypothesis that the values of the examined variables are not lower for female than for male students, with the exception of the proportion of SSVE (see Table 6.3).

As Table 6.3 shows, male students followed the secondary vocational education stream more frequently. But the genders do not differ in their math GPAs and have equal levels of preparation (effect size < 0.20). In terms of the engagement factors, the two groups do not differ in attendance of contact hours, satisfaction with active learning, satisfaction with knowledge and skills, level of academic integration, or intentions to persist (effect size < 0.20). However, female students spend more time on independent study (medium effect size of 0.44), and note a higher level of social integration (small effect size of 0.22). Furthermore, female students perform better than their male counterparts in terms of credits and retention (medium effect sizes of 0.57 and 0.36).

Table 6.3: Differences between Male and Female Students

	Males	Females	t	Sig	ES
Background characteristics					
Secondary vocational education (proportion)	.39	.27	1.847	.066	0.26
GPA math	6.93	6.83	.748	.455	0.11
Preparation of active learning skills	2.65	2.58	.720	.472	0.10
Preparation of academic knowledge & skills	3.08	3.14	-.775	.439	0.12
Engagement process factors					
Contact hours	19.90	19.08	.663	.508	0.10
Independent study hours	12.07	15.35	-3.243[1]	.002	0.44
Satisfaction with active learning	3.78	3.71	.736	.462	0.10
Satisfaction with academic knowledge & skills	3.99	4.06	-.876	.382	0.12
Social integration	4.09	4.23	-1.550	.122	0.22
Academic integration	3.66	3.74	-.831	.407	0.11
Intention to persist (proportion 'yes')	0.83	0.84	-.129	.897	0.02
Academic success					
Credits	45.69	53.13	-4.959[1]	.000	0.57
Stay	.77	.90	-3.006[1]	.017	0.36

Note: [1] Welch's t-test for unequal variances. ES = Effect Size

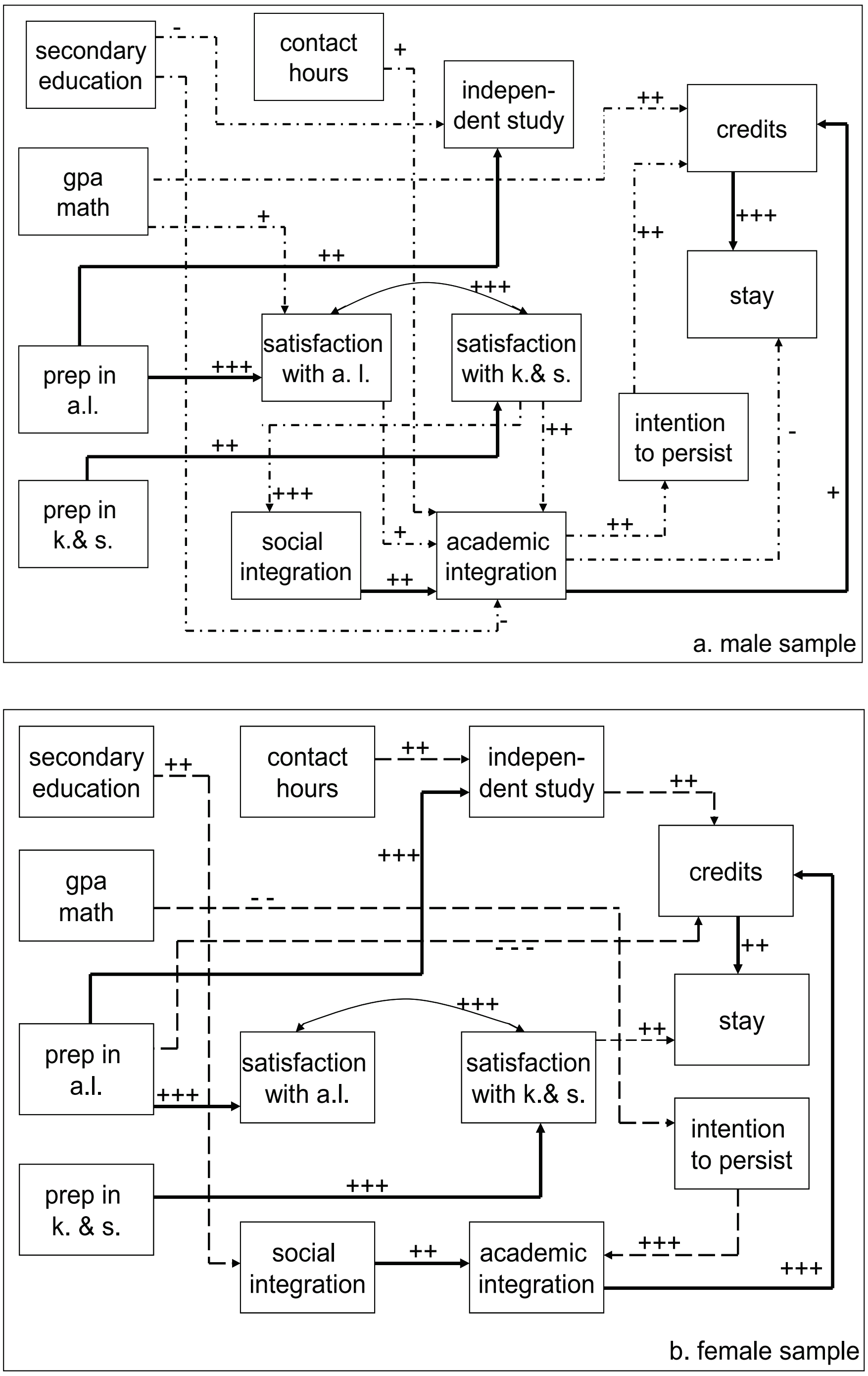
6.4.2 *Relationships*

To address our second research question, concerning causal relationships, we first calculated the correlations and covariances among the thirteen variables. For instance, for female students preparation of active learning skills and academic integration were negatively correlated with credits ($r = -.28$ and $.44$, $p < .05$). Also, for the female group satisfaction with academic knowledge and skills and academic integration were correlated with stay ($r = .27$ and $.22$, $p < .05$). This information may be indicative, but not sufficient for the determination of causal relationships. The covariance matrices, however, could be used as input for the linear structural models, which offer a more appropriate strategy for analysis of the hypothesized relationships.

6.4.3 *Linear structural models*

The paths in Figures 6.2a (male sample) and 6.2b (female sample) suggest that both background characteristics and engagement variables affect the attainment of credits and persistence. Several paths are only present in one or the other model.

These figures indicate six direct relationships that are similar across genders (in bold): preparation in active learning → time spent on independent study; preparation in active learning → satisfaction with active learning; preparation in academic knowledge and skills → satisfaction with knowledge and skills; social integration → academic integration; and academic integration → number of attained credits; and attained number of credits → stay.



Legend: - or + indicates a path between (-).10 and (-).20; -- or ++ indicates a path between (-).20 and (-).30; and --- or +++ indicates a path > (-).30. Curved ↔ = covariance between error terms. Paths in bold appear in both male and female models.

Figure 6.2: Significant Paths for (a) Male and (b) Female Students

However, in most respects the two panels in Figure 6.2 confirm that these relationships varied with gender. The dotted lines show that 11 relationships were only found for males (Figure 6.2a), whereas 6 relationships only applied for females (Figure 6.2b). For example, GPA in math and preparation in active learning negatively affected female student's number of attained credits and intention to persist in engineering, respectively. Whereas math GPA has a direct positive effect on credits among male students, and active learning is not directly related to study progress. In Table 6.4, we provide the total effects related to background characteristics (Panel a) and engagement variables (Panel b). We only pay attention to total effects of ≥ .07. Arbitrarily, effects of < .07 are interpreted as indeterminate. In the following sections D, E, and F we focus on the five hypothesized relationships (H2a-e) as they are crucial for attempts to attract and retain more female students in engineering.

Table 6.4: Total Effects

a. Background Characteristics

	1. Secondary education		2. GPA math		3. Preparation of active learning skills		4. Preparation of academic knowledge & skills	
	M	F	M	F	M	F	M	F
5. Contact hours								
6. Independent study hours	-0.18	-0.06			0.16	0.31		
7. Satisfaction with active learning			0.10		0.36	0.53		
8. Satisfaction with academic knowledge & skills							0.27	0.47
9. Social integration		0.28					0.09	
10. Academic integration	-0.13	0.06		-0.16	0.06		0.08	
11. Intention to persist	-0.03			-0.27	0.02		0.02	
12. Credits	-0.03	0.01	0.25	-0.07	0.02	-0.26	0.02	
13. Stay			0.18	-0.02		-0.06		0.13

b. Engagement Variables

	5. Cont.hrs		6. Indep.study		7. Sat. act. L.		8. Sat. k. & s.		9. Social int.		10. Acad. Int.		11. Intention		12. Credits	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
5. Contact hours																
6. Independent study hours		0.25								-0.22						
7. Satisfaction with active learning																
8. Satisfaction with academic knowledge & skills																
9. Social integration							0.32									
10. Academic integration	0.12				0.18		0.29		0.29	0.22				0.58		
11. Intention to persist	0.03	0.07			0.04		0.07		0.07		0.24					
12. Credits	0.03	0.01		0.26	0.04		0.07		0.07	0.04	0.24	0.44	0.39	0.25		
13. Stay				0.06	0.01		0.01	0.28	0.01	0.01	0.04	0.10	0.21	0.06	0.73	0.23

Note: Empty cell = no effect.

6.4.4 *Influence of preparation in active learning and independent study*

For both female and male students, prior experience with active learning positively affected the time spent on independent study and satisfaction with active learning. As we hypothesized in H2b, independent study affected the number of credits attained by female students (effect = 0.26). Thus, preparation in active learning positively influenced the number of credits indirectly through independent learning. However, contrary to our prediction in H2a, preparation in active learning had a negative influence on their credits (total effect = -0.26). For male students, no relationship between preparation in active learning and attained credits was found.

6.4.5 Influence of academic integration

For female students, academic integration affected attained credits (effect = 0.44) and staying (small effect = 0.10). For male students, we found effects of academic integration on intention to persist in engineering (effect = 0.24), and on attained credits (effect = 0.24).

In the model with data from male students, intention to persist was preceded by social and academic integration and directly influences academic success (Figure 2a). The pattern for female students differed (Figure 2b), because intention to persist *preceded* academic integration (effect = 0.58) and thus had an indirect instead of a direct influence on attained credits and staying. The total effect of intention to persist in engineering among female students was 0.25 on attained credits and 0.06 on staying.

6.4.6 *Influence of social integration*

For female students, the social integration → academic integration effect equaled 0.22. Good contacts with peers apparently had a positive impact on the degree of academic integration. For male students, a higher degree of social integration also affected academic integration (0.29).

6.4.7 *Other effects*

Our analysis also revealed "by-products" pertaining to not hypothesised gender-specific relationships. With regard to males, we found that the students with a secondary vocational education background apparently spend less time on independent study (effect = –0.18). Furthermore, the GPA in math positively affected male students' satisfaction with the educational approach (effect = –0.10), study progress (0.25), and staying (0.18). Similarly, their satisfaction with the knowledge and skills in engineering, affected their social as well as academic integration (effects of 0.32 and 0.29). Being satisfied with these knowledge and skills aspects could mean that they feel more confident in interaction with peers and faculty. Also, the attendance of contact hours had a positive impact on males' academic integration (0.12). Finally, academic integration affected males' intention to persist (0.24).

With regard to females, a not hypothesised result was that students with a secondary vocational background show a higher score on social integration (0.28). Furthermore, females' math GPA negatively impacted in intention to persist (−0.27) and also, indirectly, on academic integration (−0.16). An explanation for this result could be that engineering programmes do not contain math as a subject. As a consequence, these females could be disappointed because they expected to receive more mathematics. This may also explain that females' math GPA negatively impacts on study progress (−0.07). In contrast, females' preparation in academic knowledge and skills had a small positive effect on their persistence (0.13) whereas the effect for male students in this regard was negligible. It could mean that other subjects of their prior education were more appropriate for a good transition to the first year of engineering. Finally, the effect of the number of contact hours attended on other variables in the female model attracts attention. Contact hours influence females' independent study hours (0.25), and thus indirectly influence their study progress (0.26).

6.5 Limitations

This study has several limitations. The self-reported data may be inaccurate, whether because they are subject to socially desirable response biases, or because respondents simply cannot perceive how well prepared they were in their secondary education. A more qualitative follow-up could provide additional information about students' perceptions of and explanations for their success. For example, a longitudinal design, with measurements during the final year of secondary education and then in the first year of university studies, might reveal the causal relationships more clearly. However, with such an approach, it also might be difficult to trace empirically the changes in secondary education that have taken place in the past.

6.6 Conclusion

The first question of this paper was: What are the differences between male and female engineering students with regard to their background characteristics, engagement process factors, and academic success? We expected females to have the same or even higher rates in preparation during secondary education in active learning and knowledge and skills (H1a), engagement in terms of number of contact hours attended, satisfaction with active learning, knowledge and skills, social integration, and academic integration (H1b), independent study

(H1c), and study progress and dropout (H1d) (Griffith, 2010; Hermanussen & Booy, 2002; NCES, 2000; Zhang et al., 2005. The four hypotheses were confirmed. That is, females appeared to be equally well prepared with regard to math ability level, active learning and academic knowledge and skills. Furthermore, females have the same levels of engagement with regard to time spent on contact hours, satisfaction with active learning and knowledge and skills, and academic integration. But they even reveal a higher level of social integration. Female students also score higher than male students on time spent studying on their own. Finally, once female students are eligible for and entered the first year of engineering, they perform better than males in terms of credits and are more likely to stay.

The second question was: Do gender-specific differences appear in the relationships among background characteristics, engagement factors, and academic success? The conceptual model was helpful in formulating our expectations. Based on previous research, we expected to find some gender-specific relationships. We reject H2a, which stated that female students' preparation in active learning would have a positive influence on their academic success; rather, we found a negative influence, in contrast with prior research outcomes (e.g., Jansen & Suhre, 2010; NCES, 2000; Torenbeek, Jansen, & Hofman, 2010; Wolniak & Engberg, 2010).

However, in line with Amelink and Meszaros (2011) and Schmidt et al. (2009), we found support for H2b: Time spent studying independently has a positive impact on the credits that female students attain. Yet we found only a small effect of independent study on their staying with engineering studies. In contrast, we found no effects of independent study on males' progress or persistence. Regarding the influence of academic integration on female students' success (e.g., Amelink & Meszaros, 2011; Hewitt & Seymour, 1991; Geerdink et al., 2009; Vogt et al., 2007; Yorke, 2000), the results support H2c. Although academic integration effects on study progress and staying among both male and female students, these effects are much stronger for females.

We expected that males might benefit more from social integration (H2d), because females remain a minority who profit less from peer interaction in male dominated learning environment in engineering (Mastekaasa & Smeby, 2008; Zhang et al., 2005). However, this hypothesis was not supported by the data. For both gender groups, social integration has a modest effect on academic success, and it is not smaller for female students. Finally, consistent with the general interactionalist model (Tinto, 1993) we confirmed that the influence of intention to persist was important for males and females (H2e accepted). I.e., the factor 'intention to persist' is important in explaining study progress and retention of the two groups.

6.7 Discussion

We started this paper with the notion that today, females outperform males in higher education, which represents a shift from historical trends in engineering education. According to interactionalist approaches (Astin, 1993; Tinto, 1993), deficiencies in preparation and engagement explain why females perform poorly and leave engineering more frequently than males. In particular, these prior studies point to engagement factors related to the chilly climate that marks engineering studies, due to their male-dominated, highly impersonal, individualistic learning environments (Seymour & Hewitt, 1997). The current study takes an updated view to determine if these key factors of preparation and engagement might have changed in their impact, such that they actually work in favor of females.

The results of the first research question in this study suggest that females in engineering in this study do not experience a chilly climate. In line with literature (Hermanussen & Booy, 2002; NCES, 2000; Zhang et al., 2005), an explanation for this outcome could be that the climate has warmed in terms of the interactionalist concepts social and academic integration. Alternatively, it could be that the females in the study are undeterred by a ‘chilly climate, because they know what they are getting in an engineering school, and made the decision anyway. Also, females and males were equally satisfied with education provision with regard to active learning, knowledge and skills. Furthermore, in line with Zhang et al. (2005) who examined females in engineering-related studies, females have an equal math level at the end of secondary education. An explanation could be that in our sample females in this study belong to a vanguard. Being a-typical good performers in math they may not be representative of all females in secondary education. Moreover, females were more engaged in terms of time spent on independent learning, which concords with previous studies (Griffith, 2010; NCES, 2000).

The main focus of this study is the relationships among preparation, engagement, and academic success. The interactionalist model in Figure 6.1 has been useful for examining these relationships. In line with our resulting hypotheses, Figure 6.2 shows that for both genders, academic integration and intention to persist are relatively important determinants of study progress and persistence. Furthermore, these models are similar with regard to the influences of preparation in active learning and knowledge and skills on the two satisfaction variables and on time spent on independent study. The influence of social integration on academic integration also makes sense, because student–faculty and student–student interactions likely occur simultaneously and are related (Beekhoven et al., 2002). Furthermore, the influence of social integration on study progress and stay are the same for both genders.

However, as Figure 6.2 and Table 6.4 show, the patterns for females and males are more distinct than they are alike. The most striking differences pertain to the influence of active learning for females' academic success and the apparent different positioning of intention to persist in the two models. In contrast with our expectation, preparation in active learning has a detrimental effect on female students' attainment of credits. Apparently, the impact of pedagogical and didactical innovations in secondary education has been the reverse of that which was intended, namely, smoother transitions into higher education. This result could imply that cooperation in higher education is organized less into pairs and more into small groups, in which female students remain a minority. Thus, being comparatively well prepared in active learning in secondary education is not a guarantee that a student can bridge the gap with higher education. Another possibility is that teachers in engineering (as well as other disciplines in higher education) may be conservative and tend to over-organize the setting for active learning, which could have more discouraging and de-motivating effects on female students. However, the results of the present study cannot be used as justification to eliminate active learning.

A second striking difference between females and males relates to the positioning of 'intention to persist' in the model. The model featuring only male students suggests a causal chain from preparation and/or satisfaction, through integration, to intention to persist, to earned credits and staying. In the model for females, intention to persist is not affected by but instead precedes academic integration. This result aligns with findings that female students are more interested in a career in engineering and more likely to stay, once they have chosen for engineering as their field of study (Jones et al., 2010; NCES, 2000; Vogt et al., 2007). Perhaps, female students were more conscious of their choice for engineering and, therefore, more determined to stay in the programme from the very beginning, whereas male students make up their minds during the first year. A more qualitative approach or a longitudinal design with a larger sample of females could add further support for this result.

Intention to persist is important for both genders though. A cross tabular analysis showed a significant relation of 'intention to persist' with 'stay' (Chi-square = 8, df 1, p = .003). Twenty (35%) of the 58 students who said they might leave had in fact left the programme after one year, twice as much than the 17% (49 of 284) who had the intention to stay[3] but left the engineering programme of their first choice after one year. Similar significant relationships were found in other disciplines such as economics, health care, and social studies (chapter 7).

[3] This text uses 'intention to stay' and 'intention to persist' interchangeably.

This result confirms that intention to persist is an important reference point for the reduction of dropout of first year students in engineering and other disciplines.

The results that were not hypothesized (i.e., the 'other effects') seem to fit with these different patterns. For example, males with an SGE background spend less time on independent study and rate their academic integration lower. These males could be relatively young to pursue a career in higher education (cf. Van Bragt et al., 2007). Similarly, age could help explain why females with an SSVE background offer higher ratings of social integration. Compared with students from SGE, they have three more years of experience and thus may be more skilled in interacting with others, including both peers and faculty.

Furthermore, we have identified negative influences of math GPAs on females' intentions to persist, academic integration, and attainment of credits. Could it be that females with a high GPA in math are likely to be disappointed when they enter their first year of engineering education? In contrast, males' math GPA had a positive influence on study progress and stay. This difference could mean that females who are good in math experience high expectations and motivations from the very beginning, which can only be tempered once they experience the contents of the first-year programme. Males instead may have a more pragmatic approach, which makes them less vulnerable to disappointment. They adopt an intention to persist once they have positive experiences with the atmosphere and learning contents, and they explain their prior math achievements as fitting with this picture. However, this explanation is hypothetical and needs further research to be confirmed.

We also found an effect of independent study on females' academic success which was absent among males. It could be that independent study pays off more in credits earned when it is above a certain minimum level more reached by females than by males (see Table 6.3).

It should be noticed that this study is related with the concepts used by the National Survey of Student Engagement. The instrument of NSSE is constructed around five benchmarks of effective educational practice. This study did not explicitly use the NSSE instrument as a source. However, there are clear similarities with four of the five NSSE benchmarks (Harper & Quaye, 2009). The NSSE concepts of Level of academic challenge and Active and collaborative learning resemble our understanding of Academic knowledge and skills and Active learning. Likewise, the concepts of Student-faculty interaction and Enriching educational experiences have similarities with our operational definitions of Academic integration and Social integration. This study differs from NSSE in that it pays more attention to preparation in secondary education and focuses on first-year experience. It could be interesting if this study and other Dutch or European approaches were compared with the NSSE more in extense.

6.8 Practical implications

This study adds to the evidence that interactionalist approaches help in explaining differences in female and male engineering students' academic success. However, in line with Braxton et al. (2004) interactionalist theory is not equally applicable to different groups. Females and males may differ with regard to secondary and higher education experiences, intentions and behavior. Also, the influences of these factors on academic success may differ.

The finding that females, at least in this study, are not deterred by a chilly climate is good news for educators in engineering: Apparently extant innovations to develop female-friendly environments have been successful. A warmer environment is important for females' success in engineering, primarily through interactions with faculty (academic integration) rather than by interactions with peers. Therefore, faculty can influence both females' and males' success. Furthermore, the greater importance of independent study compared with attendance to contact hours could mean that educators should facilitate students' independent study behavior, such as by offering extra classes in how to study. Such offerings could be particularly significant for males, who spend less time on average studying on their own. At the same time, such a strategy could reinforce males' sense of academic integration.

Educators in secondary education need to recognize that the 'baggage' they load onto students remains an important factor for their future success. This influence is most obvious in the influence of males' prior math GPAs on their study progress and persistence. For females, the influence of preparation in knowledge and skills matters most. Educators in engineering can use this information to increase discretion about males' choices of an engineering field of study; they might advise males who did not take appropriate subjects in secondary education or had a relatively low math GPA to reconsider their choice of engineering. In contrast, females with the appropriate knowledge and skills should be advised to consider engineering more actively, because they are likely to succeed.

With regard to preparation in active learning, the message of this study is somewhat ambiguous for educators in secondary and engineering education. Preparation in active learning helps smooth students' transition from secondary into engineering education: it positively affects satisfaction. However, it also negatively affects females' academic success and is not related to males' academic success. Perhaps active learning simply takes different forms in secondary versus engineering education. In that case, fine-tuning of the forms of active learning across these two education levels might help transform active learning into a level of support for both females' and males' success in engineering.

Finally, intention to persist could be an important benchmark for educators. This study has shown that intention to persist, three months after the start of the programme, is an important predictor of (delays in) study progress and persistence into the second year. Females, more than males, tend to form an intention to persist from the very beginning. After twelve months, students without this intention leave the programme two times more often than students who express an intention to persist! For educators, this finding underscores the importance of providing study information about higher education and guidance during study choices as means to facilitate students' successful transition into higher education. In particular, this finding seems to apply to male students in engineering education.

Chapter 7 A General Approach Does Not Work: Disciplinary Differences as Explanations of Study Progress in Higher Vocational Education *

Abstract

In this article, we combine concepts drawn from Tinto's interactionalist theory on the causes of study departure and Becher's theory on academic tribes to explain the study progress of first-year students in higher vocational education. The data were collected using an online questionnaire, administered to more than 8,000 first-year students from five colleges (response rate = 30%). We first test a linear structural model on the basis of the selections of the total response group (*N* = 1,876), in which preparation, experience, and study behavior explain study progress in the first year. Next, we develop and compare models across the economics (*N* = 920), engineering (incl. technology) (*N* = 313), health care (*N* = 284), and social studies (*N* = 359) disciplines. The intention to stay, measured three months after the beginning of the first year, proved to be the chief predictor of study progress in all sectors. Good preparation in active learning and academic knowledge and skills acquired in prior education influenced student satisfaction about the transition from secondary to higher education and study progress. Gender, prior education, preparation in active learning in prior education, contact hours, and independent study exhibited the most important differences in terms of their effects on first-year experiences and study progress in each discipline. Thus, a generic approach is not sufficient to explain study progress, dropout analyses, quality assurance, or improved transitions from secondary and higher education. Rather, the authors recommend that researchers pay more attention to the differences across academic fields.

* Based on J. C. Kamphorst, W. H. A. Hofman, E. P. W. A. Jansen, & C. Terlouw. Een algemene benadering werkt niet. Disciplinaire verschillen als verklaring van studievoortgang in het hoger beroepsonderwijs. *Pedagogische Studiën* 89(1), 2012, 20-38.

7.1 Introduction

For many years, high dropout rates and slow study progress in the first year of college have been a stubborn problem, indicating the need for more research into factors of success and failure with regard to study progress and student departures from higher education (Inspectorate of Education, 2009). Practice-oriented theories about the transition between secondary and higher education specifically focus on success factors in the first year of higher education. These approaches address the quality of the transition, or fit, between the supplying and the receiving learning environments, to attempt to explain students' departures or delays of their further study (Jansen & Terlouw, 2009; Terlouw, 2009; Torenbeek, 2011). In this article, we examine the degree to which students' experiences with the learning environments in their prior education and the disciplinary learning environments in higher vocational education may explain study success as well. We use two theoretical angles, which each can partly clarify academic success in higher education. Students' degree of academic and social integration is an important factor for the interactionalist theory on study departure (Tinto, 1993). In Becher's theory, academic tribes, connected to epistemology, professional culture, and student population, instead influence study progress (Becher, 1994; Van Hout, 1996). Combining concepts from Tinto's and Becher's theories, we aim to form a better understanding of study success in the first year of college.

7.2 Theoretical Framework

7.2.1 Integration

In interactionalist approaches, student characteristics, environmental features, and the interactions among them determine the outcomes of the learning process in terms of behavior, psychological and cognitive aspects, study progress, and study departure (Astin, 1993; Bean, 1980). Tinto's interactionalist theory assumes that students' commitment to goals and engagement with the institution affect the extent to which they feel socially and academically integrated (Tinto, 1993). This effect is influenced by individual background characteristics. Initial commitment to goals and the institution, social and academic integration, and goals and institutional commitment in later phases all influence students' decisions to persist in their choice of education (Braxton, Hirschy, & McClendon, 2004; Pascarella & Terenzini, 2005; Tinto, 1993).

Braxton, Sullivan, and Johnson (1997) summarize Tinto's theory on study departure in 13 propositions and demonstrate empirical support for 5 of them. From their review of publications dedicated to Tinto's theory, Braxton et al. conclude that it needs some adjustment—for example, by focusing on factors that influence social integration, such as the type of institution, the extent of preparation for higher education, or other individual background characteristics.

Several previous studies empirically test the concepts of social and academic integration in the context of study progress or departure in Dutch higher education. For example, Prins (1997) demonstrates that academic integration is important for understanding study progress and dropout rates. Beekhoven et al. (2002) do not find empirical support for Tinto's discernment of social and academic integration but instead uncover only a small total, but no direct, effect of integration on study progress. Severiens and Wolff (2008) report a positive relation between academic success and "formal academic integration," meaning the interaction between students and instructors in relation to study matters and study progress. According to Onzenoort (2010), integration and institutional commitment contribute little to the explanation of study departure among students; these small effects may originate simply from different measurement methods. Moreover, Onzenoort notes that Tinto's use of the concepts of social and academic integration are based on U.S. higher education, whereas in the Netherlands, his model appeared in research into universities, rather than vocational educational institutions. The situation in the latter institutions is different, because the academic life is less active and social life outside campus is less focused on academic studies. In the Netherlands, with the exception of the University of Twente, no U.S. model–type campuses exist, in the sense that the educational institutions, through their policies, would actively attempt to engage students in extracurricular activities that lead to good social integration and ultimately more academic success.

7.2.2 Disciplinary aspects

In his theory on scientific disciplines, Becher (1994) identifies four types of academic disciplines, according to their soft/hard and pure/applied knowledge dimensions. In disciplines such as physics and chemistry, the cumulative growth of hard and pure knowledge is important. The humanities and social sciences are examples of soft, pure knowledge fields, for which the development of contextual knowledge and qualitative methods are central. In technological fields, which involve control over the physical world, hard and applied knowledge is pivotal. In contrast, soft and applied knowledge is vital for disciplines such as management and education (Becher, 1994; Neumann, Parry, & Becher, 2002; Ylijoki, 2000). The objects of study and the methodologies used to increase knowledge lead to cultural differences across disciplines and specific educational patterns and goals (Becher, 1994; Young, 2010). For example, students' and instructors' activities vary greatly for courses in health care studies, technological education, and sociology. In the first two cases, students traditionally have a full-time schedule, with relatively few individual assignments. In contrast, in the social sciences, the schedules are usually less intensive, and individual engagement with the programme is more important. These differences also reflect the normative social aspects of a discipline ("this is how we do it in this profession") and epistemology ("this is how it is, not something else") (cf. Becher, 1994).

Many studies elaborate on and confirm the influence of disciplinary cultures on education and students' learning processes (e.g., Braxton & Hargens, 1996; Kember & Leung, 2011; Lindblom-Ylänne, Trigwell, Nevgi, & Ashwin, 2006; Vermunt, 2005; Young, 2010). Lindblom-Ylänne et al. (2006) demonstrate that instructors in soft disciplines score higher with student-centered approaches than instructors in hard disciplines. The study of disciplinary differences becomes even more significant when its results can be compared with programme effectiveness. Beekhoven et al. (2003) conclude that differences across programmes explain variance in study progress, and Jansen (2004) also finds disciplinary differences in relation to curricular organizations and instruction, which plausibly contribute to varying levels of study progress. Van den Berg and Hofman (2005) illustrate that students in natural sciences study longer than in other academic directions, even after controlling for other factors, such as the average amount of hours of study per week. Pascarella and Terenzini (2005) report that students of natural sciences, mathematics, technology, business, and health care are more persistent and graduate more often than their peers in social sciences, humanities, and teacher training programs. In addition, Kember and Leung (2011) find consistent disciplinary differences related to the influences of perceptions of the learning environment on the study results.

7.2.3 Integration and scientific disciplines

In this study, we follow Braxton et al.'s (2004) advice to specify Tinto's interactionalist theory: We examine whether an analysis of four separate vocational collegiate disciplines leads to other explanations for study progress than for these disciplines cumulatively. Consequently, we acknowledge Becher's theory on scientific disciplines as a possible explanation for variance in study success. International studies show that disciplinary cultures influence integration and thus, indirectly, study success (e.g., Pascarella & Terenzini, 2005; Yorke, 2000). In the Netherlands, integration, or "binding", is a popular topic of discussions about academic success in higher education (e.g., Inspectorate of Education, 2009). Several studies (Beekhoven et al., 2003; Onzenoort, 2010; Prins, 1997; Severiens & Wolff, 2008) show that integration is relevant for explaining study success. In addition, students in some disciplines (e.g., psychology, social geography, city planning) earn more credits than do students in others (nursing, laboratory studies, international business languages) (Beekhoven et al., 2003). The question remains whether the influence of integration on study success differs for each discipline. Considering previous research, we find reasons enough to investigate study success from an interactionalist angle, while also acknowledging disciplinary differences. The propositions that, according to Braxton et al. (2004), remain pertinent, combined with other individual aspects that may exert influences before and after the first year of college, form our starting point.

7.2.4 Other factors in connection with study progress

In addition to specific disciplinary differences and integration, researchers suggest other factors determine study progress in Dutch higher education. In particular, they have used factors flowing out of the innovations in secondary education during the 1990s and early 2000s, which were aimed at improving students' transitions into college, to explain study progress in the Netherlands. For the "second phase" of Dutch secondary education (*havo* and *vwo*), a so-called study house and disciplinary profiles thus have been introduced. In addition, senior secondary vocational education (*mbo*) has moved in the direction of competency-based education. These innovations seek to develop active, independent, self-regulatory, interactive, and cooperative learning (Tweede Fase Adviespunt, 2005). Students should thus be better prepared to make the transition to student-centered learning environments in higher education, which feature problem-, project-, and competency-based education (De Weert & Boezerooij, 2007; Veugelers, 2004). Indications suggest that the preparation in this renewed model has a positive influence on students' expectations and adaptation and contributes to greater higher education effectiveness (Jansen & Suhre, 2010; Jansen & Terlouw, 2009; Torenbeek, 2011; Tweede Fase Adviespunt, 2005). However, evaluations of the introduction of the renewed second phase in secondary education also have resulted in skepticism about the effects of introducing the study house and disciplinary profiles in terms of really improving the transition to higher education (Van der Werf, 2005; Veugelers, De Jong, & Schellings, 2004).

With regard to preparation in prior education, we discern two components: active learning and academic knowledge and skills. Many studies point to the importance of the degree of preparation in active learning to establish a good fit between secondary and higher education and for good study progress (Jansen & Suhre, 2010; Jansen & Terlouw, 2009; Seidman, 2005; Torenbeek 2011). The degree of academic preparation (knowledge and skills) also has proved to have an effect on study progress and dropout rates (Braxton et al., 2004; Lowe & Cook, 2003; Ozga & Sukhnandan, 1998).

Another important factor is time allocation: The amount of time that students spend in contact hours or independent study explains academic success (Carroll, 1963). More contact hours lead to more binding and, indirectly, greater academic success in terms of the number of earned credits and a lower dropout rate (Inspectorate of Education, 2009). Suhre, Jansen, and Harskamp (2007) observe a positive effect of students’ participation in seminars, workshops, and work groups on study progress. However, several studies also suggest that more contact hours may have little or no influence (Kamphorst, Hofman, Jansen, & Terlouw, 2009b; Slavin, 1995; Van den Berg & Hofman, 2005). Moreover, Schmidt et al. (2009) show that independent study is more important than contact hours.

Students’ satisfaction with the content and design of the programme also has been regularly connected to academic success. The improved “second phase” in secondary education contributes to this satisfaction and leads to more study success, according to some authors (Jansen & Suhre, 2010; Torenbeek, 2011). However, student satisfaction as an explanation for academic success should not be overrated (Kamphorst et al., 2009b). A more important factor is the intention to stay, indicating students’ certainty about study choices (Bruinsma & Jansen, 2009; Cabrera, Nora, Castañeda, & Hengstler, 1992; Hausmann, Schofield, & Woods, 2007; Milem & Berger, 1997). The type of prior education and gender also are important for explaining academic success (Beekhoven et al., 2003; Buchmann, 2009; Kamphorst et al., 2009b; Sax & Bryant, 2006; Van den Berg & Hofman, 2005).

7.2.5 Conceptual model

The interactionalist model of transition between secondary and higher education (Figure 7.1) that we apply in this study consists of three components: the preparatory phase, the transitory phase, and the outcomes of both of these phases (Biggs, Kember, & Leung, 2001; Hossler, Schmitt, & Vesper, 1999).

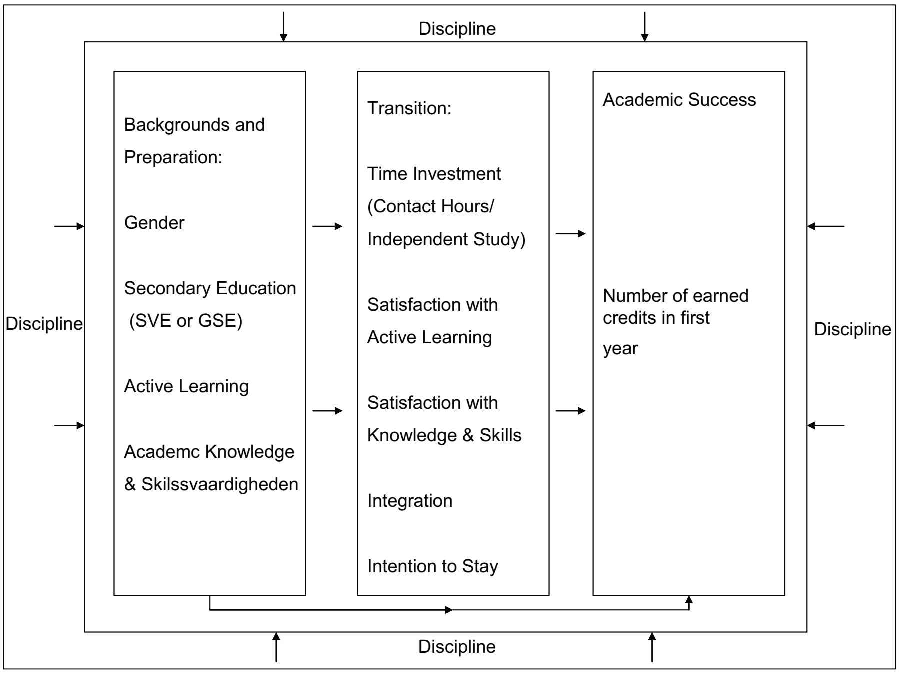


Figure 7.1: Conceptual Model

The factors we discern in the preparatory phase are gender, prior education, the degree of preparation in active learning, and the degree of preparation in academic knowledge and skills. These factors influence students' experience and behavior in the transitory phase in the first year of higher vocational education (*hbo*). Important in this phase are the time students spend on contact hours and independent study, the degree to which students are satisfied with aspects of education that call for active learning and academic knowledge and skills, the integration of students (with a social and an academic component), and, as the result of a provisional balance that students can make up for themselves three months after the start of the first year, their intention to stay in the programme (Biggs et al., 2001; Braxton et al., 2004; Hossler et al., 1999; Terlouw, 2009; Tinto, 1993). Finally, the preparation and transition factors discerned in the model determine study progress, which is defined as the number of credits earned (Ecs) at the end of the first year.

The disciplinary context influences these relations. The conceptual model serves as the starting point for the research questions of this study:

1. What connections exist between study progress and background characteristics, relating to prior education, the experiences with the learning environment, and student behavior in the first three months of the first year? We expect that women perform better than men, which is partly explained by different study behavior (Sax & Bryant, 2006, among others); that good preparation directly and indirectly influences study progress

(Torenbeek, 2011); and that students with a senior general secondary education (*havo*) spend less time on their studies but are better integrated than students with a senior secondary vocational education (*mbo*) (Kamphorst et al., 2009b).

2. Does a specification of the relations for different disciplines contribute to a better explanation of study progress in the first year?

7.3 Method

7.3.1 Population and sample

Three months after the beginning of the school year, an online questionnaire was administered to 8,164 first-year students at five large colleges. Only students who started a programme for the first time are part of the sample. The response rate was 30% (2,490 respondents), of which 84% (2,082 respondents) had completed a secondary education diploma and belonged to one of the four selected disciplines. Table 7.1 presents the background aspects for the selection and population.

Table 7.1: Descriptives

	Sample (N = 2,082)	Population (N = 8,164)
Economics	0.49	0.53
Social studies	0.20	0.13
Engineering (incl. Technology	0.17	0.21
Health care	0.15	0.13
Men (= 0)	0.40	0.50
Women (=1)	0.60	0.50
SSVE (= 0)	0.33	0.37
SGE (= 1)	0,67	0,63

Note: SSVE = senior secondary vocational education degree; SGE = senior general secondary education diploma.

As Table 7.1 shows, economics is the largest sector in the sample, followed by social studies, engineering, and health care. Three of five respondents are women. Two-thirds of the respondents have a senior general secondary education diploma (SGE), and one-third have a senior secondary vocational education degree (SSVE4-Certificate). We can conclude that the selection is reasonably representative with regard to gender, prior education, and discipline. The selection of respondents earned 47.06 Ecs, which is roughly four points more than the average Ecs earned by all first-year students in the four disciplines of the participating colleges.

7.3.2 Data collection and variables

We collected individual student data, such as study progress, discipline, gender, and secondary education, through the institution's student administration and a unique code coupled with the survey data. Students had the opportunity to give their opinion about their degree of preparation in aspects that the "Second Phase Advice Point" (Tweede Fase Adviespunt, 2005) considers relevant for an effective transition to higher education. Next, students noted their degree of satisfaction about their own transition. Finally, they responded to items involving academic and social contacts within their programme (Beekhoven et al., 2002). Table 7.2 summarizes the variables.

Table 7.2: Variables in the study: Backgrounds and preparation, transition, and study progress

	No of items	Cronbach's alpha
Preparation in active learning (1 = low, 5 = high)	6[2]	.84
Preparation in academic knowledge and skills (1 = low, 5 = high).	8[2]	.76
Contact hours (1–40 per week)	1	-
Independent study hours (1–50 per week)	1	-
Satisfaction with active learning in the first year (1 = low, 6 = high)	6[1]	.87
Satisfaction with academic knowledge and skills in the first year (1=low, 6=high).	8[1]	.84
Social integration (1 = low, 5 = high)	4[1]	.84
Academic integration (1 = low, 5 = high)	3[1]	.73
Intention to persist (0 = no, 1 = yes)	1	-
Earned credits (Ecs) (1–69)	1	-

Note: 1. See Appendix C.1 for all items. 2. See Appendix C.2 for all items.

We performed a factor analysis with unweighted least squares and Varimax rotation on the *preparation* (1 and 2), *satisfaction about the transition between secondary and higher education* (5 and 6), and *integration* (7 and 8) variables, which resulted in six dimensions with factor loadings greater than .40. Next, we performed reliability analyses, resulting in six reliable scales with Cronbach's alpha values varying from .73 to .87. We measured *intention to stay* with one item (Cabrera et al., 1992; Hausmann et al., 2007; Milem & Berger, 1997). Intentions to stay seem connected to social/academic integration; this variable also offers a good predictor of the dropout rates of first-year students. We measured s*tudy progress* using the number of credits (Ecs) at the end of the first year. Students in the researched colleges earn credits on the basis of an array of testing moments, such as knowledge quizzes, individual and group assignments, and skill tests. Total Ecs in turn is an important ingredient in the student's decision whether to advance to the second year. Furthermore, as a study variable, *Ecs* are advantageous, in that they approach a more normal spread than the dichotomous *study departure* variables. Table 7.3 provides an overview of the variables, split by discipline.

Table 7.3: Means, Total and by Discipline

	Total	Ec	Eng	H	S	Significant Differences*
Gender (male)	0.40	0.44	0.82	0.14	0.13	H, S < Ec < Eng
SGE	0.67	0.68	0.63	0.78	0.57	S < Ec < H Eng > H
Preparation in active learning	2.69	2.67	2.63	2.75	2.76	-
Preparation in academic knowledge and skills	3.16	3.15	3.10	3.22	3.19	Eng < H
Contact hours	15.32	14.39	19.75	14.98	14.03	Ec. S. H < Eng
Independent study hours	13.48	13.27	12.67	14.77	13.69	Ec, Eng < H
Satisfaction with active learning in the first year	3.73	3.72	3.77	3.68	3.75	-
Satisfaction with academic knowledge and skills in the first year	4.01	4.01	4.01	4.03	3.98	-

	Total	Ec	Eng	H	S	Significant Differences*
Social integration	4.14	4.12	4.12	4.25	4.14	-
Academic integration	3.63	3.65	3.68	3.60	3.59	-
Persistence	0.83	0.82	0.83	0.86	0.82	-
Ecs, first year	47.06	47.30	47.03	49.88	44.36	S < Ec. Eng. H

Notes: * $p < .01$. Ec = economics, Eng = engineering, H = health care S = social studies

The respondents scored an average of 2.69 on preparation in active learning, which means that they spent a "reasonable amount of time" on this aspect (3 on a five-point scale). In comparison, they spent more time on preparation in academic knowledge and skills, with an average score of 3.19. On average, they had 15.32 contact hours and spent 13.48 hours on independent study. The respondents were sufficiently satisfied with their education, in terms of both active learning (average = 3.73 on a six-point scale) and academic knowledge and skills (average = 4.01). The respondents scored a high average of 4.14 on social integration (more than "satisfied"), but lower on academic integration (3.63). Almost one in five students did not continue in his or her choice of programme. On average, the respondents earned 47.06 Ecs in the first year. A one-way analysis of variance shows several significant discrepancies among the disciplines with regard to *gender*, *secondary education*, *preparation in academic knowledge and skills*, *contact hours*, *hours of independent study*, and *Ecs*. No significant differences in average scores arose between disciplines for the other variables (Table 3, last column). The small number of differences between disciplines suggests that the correlation between variables for each discipline will not be the same; further analysis of the relations between these factors thus is needed.

7.3.3 Analysis strategy

Using linear-structural models (Lisrel 8.53: Jöreskog & Sörbom, 1993), we closely examined the relations among independent variables, intermediate variables, and study progress. The covariance matrix of the standardized scores served as the input for the analyses. We analyzed five models with latent variables. The measurement models were defined on the basis of the available reliability coefficients of the six scales. In other cases (*gender*, *secondary education*, *contact hours*, *hours of independent study*, *intention to stay*, and *Ecs*), the relations of the observed variables with the latent variables remained fixed at 1. The fit information the first developed model (total sample) suggested that social integration and academic integration indicated just one latent variable, as corroborated by the subsequent results.

The remainder of the procedure was as follows: After we developed the general model, based on all complete cases (N = 1,876), we tested comparable models for economics, engineering, health care, and social studies. As we discuss subsequently, the four specific models differed from the general model and among themselves, in terms of the amount and strength of the paths between the independent and the intermediate variables, and the dependent variable, Ecs. We report several indicators related to the fit estimation for the models (Jöreskog & Sörbom, 1993): chi-square (with a cutoff value of $p > .05$), root mean square residual (cutoff value < .05), the standardized root mean square residual (cutoff value > .95). The fit indices of the five models were good (Table 7.4), as were their standardized residuals (< 3.0). The percentages explained variance of earned credits were 13% (general model), 12 % (economics), 14% (engineering), 14% (health care), and 14% (social studies).

Table 7.4: Fit Indices and Explained Variance of the Linear Structural Models: Total Sample and Four Disciplines

	Total (N = 1,876)	Ec (N = 920)	Eng (N = 313)	H (N = 284)	S (N = 359)
Chi-square of p-value (degrees of freedom)	40.85 p = 0.11 (df = 31)	34.60 p = 0.54 (df = 36)	28.55 p = 0.84 (df = 37)	32.81 p =0.62 (df = 36)	49.01 p = 0.11 (df = 38)
Root mean square residual	0.013	0.00	0.00	0.00	0.028
Standardized root mean square residual	0.016	0.020	0.031	0.023	0.035
Non-normed fit index	1.00	1.00	1.02	0.96	0.97
Explained variance	13%	12%	14%	14%	14%

Note: Ec = economics, Eng = engineering, H = health care, S = social studies

7.4 Results

The first research question involves the development of a general model that properly reproduces the relations of the independent and intermediary variables with the dependent variable Ecs. Figure 7.2 presents the linear structural analysis that resulted in the model.

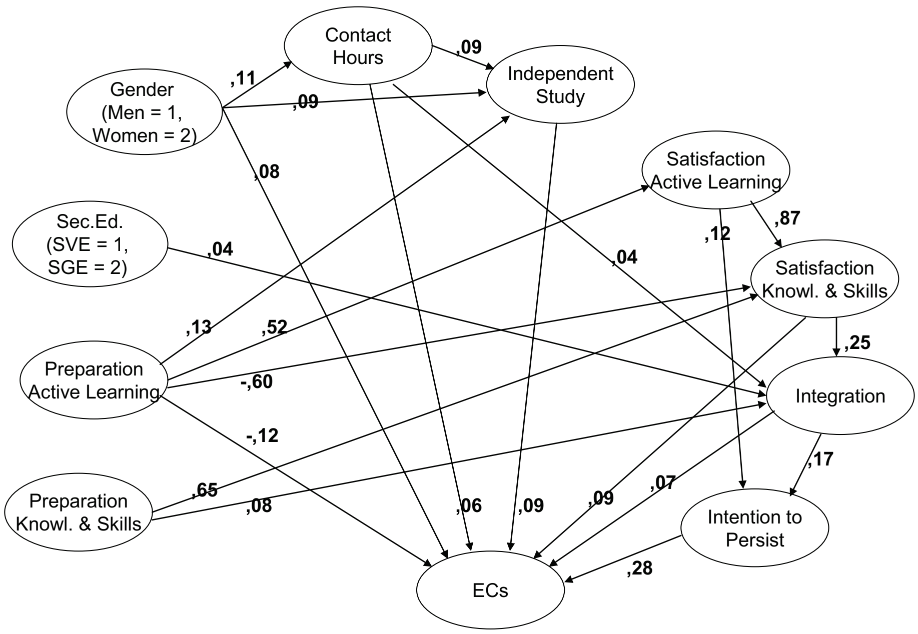


Figure 7.2: Significant Direct Effects General Model (N = 1,876; χ^2 = 40.85; p = .11, df = 31)

The model depicts the significant effects of the variables on the amount of Ecs. For example, women earned more credits than men. The negative effect of preparation in active learning on Ecs appeared notable as well. Of all the paths, that from *intention to stay* to *Ecs* (direct effect = .28) was strongest. However, many of the *exogenous* variables (gender, prior education, preparation in active learning, and preparation in academic knowledge and skills) exerted indirect effects on the amount of Ecs, through the intermediate variables in the model (time spent on study, satisfaction, integration, and the intention to stay). For example, the path *gender → independent study hours* (direct effect = .09) indicated that women spent more time on their studies, which indirectly contributed to their better study progress. Prior education had a direct effect on integration; students with an SGE were less integrated than students with an SSVE, contributing to their lower levels of academic success. The effects of preparation in active learning and academic knowledge and skills on study progress were mediated by satisfaction in the first year and partly by integration and intention to stay.

To answer the second research question, we developed models for each discipline individually. They deviated from the general model. Appendix D (Figures a–d) shows the direct effects of the four models. In Table 7.5, we represent the effects of the independent and intermediate variables in order of the strength of total effects on earned credits in the general model.

Table 7.5: Total Effects on Earned Credits: Total and Disciplines

Factors (in Order of Weights for Total):	Total	Ec	Eng	H	S
1. Intention to persist	0.28	0.27	0.27	0.28	0.32
2. Satisfaction with active learning	0.14	0.17	0.10	-	0.06
3. Satisfaction with academic knowledge and skills	0.12	0.16	0.06	-	0.01
4. Integration	0.11	0.11	0.18	0.03	0.04
5. Preparation in active learning	-0.10	-0.11	0.00	-	-0.12
6. Independent study	0.09	0.08	0.00	0.16	0.03
7. Gender	0.08	0.07	0.18	0.11	0.00
8. Preparation academic knowledge and skills	0.07	0.11	0.00	-	0.00
9. Contact hours	0.07	0.01	0.02	0.14	0.15
10.Secondary education	0.00	-0.01	-	-0.03	0.00

Note. Ec = economics, Eng = engineering, H = health care, S = social studies

The intention to stay, with the effects varying from .27 to .32, remained the most important predictor of study progress. For the rest, the models differed, including the direct effects (see the Appendix). Consequently, the general model cannot adequately reproduce the relations on the level of the four disciplines individually.

7.4.1 Gender

Women spent more time on independent study in the engineering and social studies disciplines (direct effects of .21 and .10, respectively). Gender also influenced academic success; women earned more credits at the end of their first year in economics, engineering, and health care (direct effects of .07, .18, and .11, respectively). However, it had no effect on Ecs in the social studies discipline.

7.4.2 Prior education

Prior education influences integration into social studies, in which students with an SGE were less integrated than students with an SSVE (direct effect = .07). In economics, engineering, and health care, we note an effect of prior education on time spent on studies, such that students with an SGE spent less time on independent study (direct effects of –.10, –.15, and –.17, respectively). In economics and health care, there was a small effect of prior education on study progress. That is, all else being equal, students with an SSVE earned a few more credits, attributable to their greater independent study. In the social studies sector, we found no significant effect of prior education on study behavior though.

7.4.3 Preparation

Good preparation in active learning during prior education has a positive effect on student satisfaction with active learning in the first year of all disciplines. This effect was stronger in the engineering (direct effect = .75) discipline than in health care (.61), social studies (.52), or economics (.51). All models showed a direct, negative effect of preparation in active learning on satisfaction with academic knowledge and skills in engineering (–.70), economics (–.62), health care (–.63), and social studies (–.54).

Furthermore, we observed a positive effect of preparation in active learning on independent study in the models for engineering (direct effect = .20) and economics (.12). Seemingly, students in these disciplines spend more time on independent study than other students, when they have had better preparation in active learning. We did not observe this effect in health care or social studies. Moreover, we found negative effects of preparation in active learning on Ecs for economics, engineering, and social studies (direct effects of –.11, –.14, and –.15, respectively). In health care, we found no direct effect. The indirect effect of preparation in active learning through independent study was too small to compensate for the negative effects this preparation exerted on the amount of Ecs.

With regard to preparation in academic knowledge and skills, we found a positive influence on student satisfaction with knowledge and skills in all four disciplines (direct effects varying from .62 to .67). Also we found a negative effect of preparation in academic knowledge and skills arose for the degree of integration in the social studies discipline (direct effect = –

.10). However, this was not the case for the rest of the disciplines. Only in economics was the total effect of this variable positive for study progress (total effect = .11).

7.4.4 Study behavior

The four sectors showed strongly different results with regard to the influence of reported contact hours and hours spent on independent study on Ecs. In the health care programs, we observed direct effects of both contact hours and hours spent on independent study on the amount of earned credits (.14 and .16, respectively). In economics, there was only a direct effect (.08) of independent study on earned credits. In social studies, we observed only an effect of contact hours on Ecs (direct effect = .15). In engineering, we found a small indirect effect (.02) of contact hours on Ecs, emerging from the mediating effect of integration and intention to stay.

7.4.5 Student satisfaction

In economics, student satisfaction with active learning influenced satisfaction with knowledge and skills and the intention to stay (direct effects of .87 and .11, respectively). Moreover, student satisfaction with active learning had, through satisfaction with knowledge and skills, a positive effect on integration in the economics discipline. The models used for engineering and social studies showed a direct effect of student satisfaction with active learning on knowledge and skills (.98 and .82, respectively) and the intention to stay (.17 and .16, respectively). The model for health care showed a discrepancy from the other models: Student satisfaction with active learning did not influence integration, but satisfaction with active learning was influenced by integration (direct effect = .12).

Student satisfaction with knowledge and skills positively influenced integration in the engineering, social studies, and economics disciplines (direct effects of .31, .27, and .20, respectively). In this regard, we observed no effect in health care. Satisfaction with knowledge and skills had a direct effect on the amount of Ecs in the model for economics (.14) but not in the models of the other disciplines.

7.4.6 Intention to stay

In the four models, intention to stay had the biggest positive influence on the amount of Ecs. The direct effect varied from .27 (economics) to .32 (social studies).

7.5 Conclusion and Discussion

The first research question of this study is as follows: "What connections exist between study progress and background characteristics, relating to prior education, the experiences with the learning environment, and student behavior in the first three months of the first year?" We selected the variables and defined them according to the concepts of social and academic integration and commitment from Tinto's (1993) theory on study departure, supplemented with other factors (gender, type of secondary education, preparation, satisfaction, hours spent on independent study, and contact time) that previous research has found relevant for explaining academic success in higher education (Buchmann, 2009; Carroll, 1963; Jansen & Suhre, 2010; Jansen & Terlouw, 2009; Sax & Bryant, 2006; Seidman, 2005; Torenbeek, 2011; Tweede Fase Adviespunt, 2005; Van den Berg & Hofman, 2005). The general model shows that gender, type of secondary education, and the degree of preparation all influence study progress, as well as that this influence partly runs through reported study time, satisfaction, integration, and intention to stay. In agreement with Beekhoven et al. (2003), integration seemed to be one variable with two components in this model. By far, the most important success factor in the general model is the intention to stay. Consistent with our expectations, women perform better than men. Contrary to our expectations, students with an SSVE are better integrated, though this does not mean that students with an SGE earned fewer credits than students with a senior SSVE. Furthermore, unexpectedly, preparation in active learning ultimately exerted a negative total effect on study progress.

The second research question was as follows: "Does a specification of the relations for different disciplines contribute to a better explanation of study progress in the first year?" We suspected that the factors in the transition model presented in Figure 1 would play different roles in explaining academic success (e.g., Braxton & Hargens, 1996; Kember & Leung, 2011; Vermunt, 2005). The interactions between individual background characteristics and students' perceptions of and experiences with the learning environment, and the influence of these factors on academic success, differed for each discipline. The four linear structural models showed that intention to stay, notwithstanding the discipline, offered an important predictor of study progress. Another similarity across three of the four disciplines (except health care) was the positive influence of integration on study progress, though the sizes of the effect differed. Furthermore, we noted positive effects of preparation on the similar dimensions of student satisfaction (with active learning and academic knowledge and skills). Simultaneously, preparation in active learning had negative effects on satisfaction with academic knowledge and skills, which then mitigated the positive indirect effects of preparation in active learning on study progress in three sectors (except health care). Another difference among disciplines involved the effect of reported study time on study progress. In health care, contact hours and independent study both had positive effects on study progress; in economics, more hours of independent study were beneficial; and in social studies, the positive effect came through more contact hours. In addition, we uncovered an effect of gender on study progress in economics, engineering, and health care (women perform better), but not in social studies (no difference in gender). Finally, the type of secondary education exerted a small effect on study progress, though only in health care and economics: Students with SSVEs perform slightly better than students with SGEs.

We thus conclude that combining interactionalist theory on study departure with insights into the differences between disciplines results in a better understanding of study progress. Sector-specific influences include individual background characteristics and perceptions of the learning environment. This explanation may hold for study departure as well, though it is not the focus of the current study. This study rather delivers sector-specific information, through the specifications of relations, that remains hidden in many other studies. Although disciplinary analyses have proven important (Braxton & Hargens, 1996; Kember & Leung, 2011; Vermunt, 2005), many studies are based on the data from only one discipline or do not split up data sufficiently according to discipline, which ultimately implies that the results are the same in all disciplines. In this case, institutions may be taking measures that do not improve study progress or do not decrease study departure in certain programs. We illustrate this conclusion with some examples from our study.

Many institutions have increased the number of *contact hours* for students in their first years, aiming to increase academic integration, or binding, and thus positively influence study progress. Our study shows that contact hours influence study progress positively in health care and social studies, but this factor barely contributes in economics and engineering disciplines (cf. Slavin, 1995) and only contributes to more integration in engineering. Independent study has a direct effect on study progress in economics and health care (cf. Schmidt et al., 2009) but a negligible effect for engineering and social studies disciplines. Furthermore, contact hours influence integration only in engineering.

Some studies find positive effects of preparation, by which we mean preparation with regard to active learning and academic knowledge and skills, on study success (Jansen & Suhre, 2010; Robbins et al., 2004). In contrast, we find a negative effect of preparation in active learning on study progress in economics, engineering, and social studies. Consequently, active learning is not necessarily a good strategy as a form of preparation for higher education. We posit an explanation based on each discipline's epistemology (e.g., Braxton & Hargens, 1996; Kember & Leung, 2011; Young, 2010). That is, preparation in active learning might be less effective when factual knowledge is relatively important (e.g., economics, engineering) and/or because the type of student who pursues these disciplines tends to want more factual knowledge than is necessary and must work to adapt to the idea that knowledge is relative and contextual (social studies). In contrast, preparation in active learning positively influences independent study in economics and engineering. Through independent study, preparation in active learning can directly influence study progress, and in this sense, such preparation can help students realize a gradual transition (Jansen & Suhre, 2010; Suhre et al., 2007). However, this positive effect is weakened in the economics, engineering, and social studies disciplines by the direct negative influence of experiences with active learning during prior education on study progress.

This study also confirms that *women* perform better than men, especially in engineering, but also in economics and health care. This result resembles that of previous research on this subject (Sax & Bryant, 2006; Van den Berg & Hofman, 2005). Aspects of the programme can influence (gender-) stereotypical behavior, such as the amount of hours spent on independent study, and this influence can vary by discipline (Pascarella & Terenzini, 2005; Sax & Bryant, 2006). In our study, women spent more time on independent study in social studies and engineering disciplines (see the gender → independent study path in the Appendix D, Figures b and d). Their greater independent study did not result in more Ecs in these two disciplines though, because the second part of the path gender → independent study → Ecs path broke down. This result may reflect the gender ratio in the student population (18% women in engineering; > 85% women in health care and social studies). The student population's gender bias influences aspects of the learning environment and academic climate, which in turn affect students' perceptions and Ecs (Astin, 1993; Pascerella & Terenzini, 2005). In the same way, gender biases in the population may influence study behavior. The differential influences of gender on academic behavior and study progress thus can be explained partly by the makeup of the student population.

Finally, we address the influence of the type of *prior education* on differences in study progress in the first year. This study shows small effects in economics and health care, in which students with an SSVE earn a few more credits than students with an SGE. In both disciplines, this effect correlates with the time that students with an SSVE spend on independent study. A possible explanation is that students with an SGE are less independent than students with an SSVE and less committed to independent study. Another effect we find in social studies is that students with an SGE report a lower degree of integration, which leads to a smaller amount of Ecs. Perhaps teaching in the first year is less woven into the prior education of this group.

This study was based on Becher's (1994) typology of academic disciplines. Previous research has shown that distinguishing soft/hard and pure/applied disciplines is relevant to education, student learning, and the explanation of study success in higher education (Beekhoven et al., 2003; Kember & Leung, 2011; Lindblom-Ylänne et al., 2006; Pascarella & Terenzini, 2005; Vermunt, 2005; Yorke, 2000; Young, 2010). Braxton and Hargens (1996) indicate that instructors in soft academic disciplines with a low consensus (e.g., sociology, political science) more often use a student-centered approach, pay attention to personal growth, and give exams with more critical (analytical) questions and fewer factual knowledge questions than their colleagues in hard academic disciplines with a high consensus (e.g., chemistry, physics). In this explanation, the degree of consensus in the academic field influences the way knowledge is treated, which in turn affects the pedagogical and didactical aspects of education. For example, in sociology or political science, active learning consists of group discussion and analysis, along with a recognition that the students' future occupation is likely to change. In contrast, the knowledge domain of technological studies is more marked by certain factual knowledge, laws, and models, which are more difficult to use with a discursive approach.

Do collegiate disciplines, with their interdisciplinary programmes and education reforms (e.g., problem-based education, competence-based education), reflect, in their pure form, the epistemological differences among the stereotypical combinations of hard/pure, soft/pure, hard/applied, and soft/applied in traditional higher education, to which Becher refers? The results of our study show relatively few disciplinary differences in perceptions of the learning environment, but the data clearly indicate varying effects of diverse factors on study progress in ways that could be theoretically expected. Moreover, it is assumed, though not yet proven, that students' learning behavior has different effects on study progress, depending on the discipline. Further research could focus on further validating Becher's typology of disciplines in higher vocational education, the influence of epistemology on aspects of instructors' behavior, the experience of the learning environment, and academic results in different disciplines (cf. Kember & Leung, 2011).

This study has important practical implications for research involving quality assurance and improving the transition between secondary and higher education. Quality assurance in higher education is often aimed at indicators of performance, such as how many hours student study, average satisfaction, or average rates of integration. This study shows that available information should be interpreted at the discipline level (Kekäle, 2000; Ylijoki, 2000; Young,

2010) and that average scores or standard deviations are not the only important indicators. In particular, relations among student background characteristics, preparation, study behavior, satisfaction, and integration with regard to intentions to stay and study progress are important and vary by discipline. Generalizations on the basis of research done on study progress in one discipline can lead to incorrect conclusions and advice for improvement. Effectiveness policies formulated on the institutional level need to address these differences.

Generic measures to improve the quality of education likely will have limited reach. In this study, we have found that the intention to stay is the most important factor for explaining and predicting study progress. Students who consider dropping out right after the beginning of a programme constitute almost 20% of the first-year population (Table 2)—a significant number, considering that a large part of this group (40%–50%) leaves the programme after a year (Kamphorst, Hofman, Jansen, & Terlouw, 2010). For a good portion of the first year, this group receives teaching and training, but they still do not return. The intention to (not) stay is a good starting point for programs, disciplines, and institutions to find ways to enhance study success. We see several possibilities. In particular, dealing with students' doubts about the right choice of study—for example, using known measures such as good counseling, tryout days, summer school, and motivation screenings—could be effective (Van Asselt, 2007; Terlouw, 2009). Forwarded registration, which leaves sufficient time to redress poor choices, also contributes to more certainty among students about their choice of programme at the beginning of the first year. Programmes and institutions also need to take 'spijtoptanten' (i.e., persons who regret their study choice and consider withdrawing or switch for that reason) into account—for example, by organizing intensive guidance, a better propaedeutic curriculum, or more than one period for easy withdrawal per year.

Chapter 8 Integration, Meaning-directed Learning, and Study Progress in Higher Education *

Abstract

The authors examine whether combining concepts of interactionalist theories on student departure with concepts of meaning-directed learning might lead to a better model for explaining academic achievement. They developed a structural equation model in which social and academic integration are causally related with the variables value, deep approach to learning, procrastination, self-regulation, self-confidence, and study progress. The results show that social and academic integration mainly impact on value and self-confidence. Value, procrastination, and self-confidence are mediators between both forms of integration and study progress. Self-regulation and deep approach to learning hardly impact on achievement. The authors conclude that research in which sociological and psychological variables are combined may be helpful in some regards. Social and academic integration may affect student motivation, but are neutral with regard to self-regulation and deep approach to learning and its contributions to study progress. Specifying the concepts of social and academic integration on the level of classroom interactions combined with cross-gender and ethnic-group comparisons might result in better explanations of student learning as well as study progress. Institutional research might be more relevant for improving effectiveness in higher education if it manages to deal with this challenge.

* Based on J. C. Kamphorst, W. H. A. Hofman, E. P. W. A. Jansen, & C. Terlouw. Integration, Meaning-directed Learning, and Study Progress in Higher Education. *Under review by Higher Education Research and Development.*

8.1 Introduction

Many studies have shown that several related components of ‘meaning-directed learning’, such as self-regulation, intrinsic motivation, procrastination and deep approach to learning, affect students’ study progress (Entwistle & Peterson, 2004; Pintrich & De Groot, 1990; Vermunt, 2005; Vermunt & Vermetten, 2004). Kamphorst, Hofman, Jansen, & Terlouw (2012) confirmed that a model in which these learning process factors are related to earned credits is applicable to first year students in Dutch higher vocational education. However, the explained variance of earned credits by single factors was small. An explanation for this not unusual result is offered by Hattie’s (2009) rope-analogy: Single factors show relatively low relationships due to their overlapping, which resembles the many fibers of a rope. The limited contribution of single factors to study progress uncovered by research may be at odds with the demand for institutional effectiveness by simple though powerful measures.

Another explanation why learning process factors affect study progress to a small degree might be the neglect of students’ interactions with peer students (social integration) and lecturers (academic integration) in many studies. In the tradition of motivation and learning theories the importance of social processes for academic achievement is recognized (e.g., Wentzel, 1997; Wigfield & Wagner, 2005). Similarly, interactionalist researchers suggested that linking of Tinto’s (1993) concepts of social and academic integration with learning and motivation might lead to improved explanations of study progress (Astin, 1993; Braxton, 2000; Braxton, Sullivan, & Johnson, 1997; Pascarella & Terenzini, 2005; Severiens & Wolff, 2008).

Tinto formulated his theory in which social and academic integration take a central place, in order to better understand student departure (Braxton, 2000). The theory was in the first place formulated for practitioners and scholars on the level of institutions. In contrast, the focus of psychological approaches is on the strategies of student learning (Pascarella & Terenzini, 2005). These approaches are in the first place appropriate for use in the classroom and in feedback to students. Meaning-directed learning in this approach is considered as a factor which is conducive to learning outcomes. In both approaches, however, student engagement is a driving force behind study behavior in terms of persistence or learning strategy (Astin, 1993; Harper & Quaye, 2009. In Tinto’s theory, engagement is defined in terms of initial and subsequent intentions and commitments, and interactions with peers and staff. Engagement in meaning-directed learning is captured in components such as intrinsic value defined in terms of personal interest in and appreciation of a study and deep approach to learning.

To reach a better explanation of study progress, we developed a model in which social and academic integration is related with some characteristics specific to meaning-directed learning. The conceptual model was tested on a sample of freshmen in three Dutch universities.

8.2 Theoretical framework

Study progress, the phenomenon to be explained in this study, is the number of credits attained by first-year students in a bachelor programme. Students have to attain 60 credits in the first year. One credit is equivalent to 28 study hours. Students in Dutch higher vocational education are basically following the same obligatory courses in a first year programme, i.e., there are no electives, or, with a few exceptions, individual trajectories during this year. The concepts which are examined in relation with study progress are defined as follows.

Social and academic integration

Social integration is the quality of contacts of students with peers (Tinto, 1993). Students who are socially integrated are satisfied about the contacts with peers, feel at ease with the type of students in the programme, and easily befriend with other students. Academic integration refers to the quality of contacts with teachers and the institutional climate. Academically integrated students are satisfied with the teachers' mentoring and with the didactical work forms in the first year.

Many studies showed that social and academic integration are important for student persistence. However, the merits of Tinto's (1993) interactionalist model are limited. Braxton, Hirschy and McClendon (2004) noticed that Tinto's model is not similarly applicable for all types of higher education institutions, genders or ethnic groups. Also, several researchers proposed the development of a more inclusive theory for explaining academic achievement, in which not only sociological but also psychological factors are considered (Braxton et al., 1997; Pascarella & Terenzini, 2005; Yorke & Longden, 2004). Tinto (1993) asserted that his model does not unfold how exactly the contacts with lecturers and peers influence students' motivation and learning, and that an extension of the model in this direction would be attractive. In their review of research based on Tinto's model, Braxton et al. (1997) found only one publication by Stage (1989) in which social and academic integration had been linked with students' 'motivational orientations'. Stage distinguished between three subgroups with different motivational orientations. The subgroup with a cognitive orientation, with an attitude of seeking knowledge and learning for the sake of learning, least fitted in Tinto's model in which integration influences persistence. Students with a certificate orientation, who are motivated by goals such as to earn a degree or to get a good job, or a community service orientation, for example to gain skills for helping others, showed a stronger relationship between integration and persistence.

Several recent studies in the Netherlands also pointed at the relations of integration with aspects of motivation or learning (Bruinsma, 2003; Severiens & Wolf, 2008; Torenbeek, Hofman & Jansen, 2010). Severiens and Wolff (2008) found a relationship among higher levels of academic integration, a deep approach to learning, and attainment of credits. Bruinsma (2003) treated the variable involvement as a general indicator of integration, and this affected motivation in terms of self-confidence. However, Bruinsma found no relationship between involvement and deep approach to learning.

Meaning- directed learning

Central components of meaning-directed learning are self-regulation, motivation and a deep approach to learning (Entwistle & McCune, 2004). Self-regulation is the extent a person perceives him/herself as capable of exercising influence over motivation, thinking, emotions, and the behavior that is connected to these factors (Boekaerts, 1999). This capability involves that a student is aware of, and able to manage and control, his/her learning process, and knows when to use varying cognitive strategies in order to conduct a learning task (Pintrich & De Groot, 1990; Entwistle & Peterson, 1990).

Motivation, the second concept, is what drives people to action (Eccles & Wigfield, 2002). Motivation is related to the purposes and goals, the learning intentions and challenges, the personal drives, as well as the intrinsic and extrinsic properties, of the (set of) task(s) that a student is pursuing (Hattie, 2009). In the present study we distinguished three aspects of motivation: ‘value’, ‘procrastination’ and ‘self-confidence’ (Bruinsma, 2004; Eccles & Wigfield, 2002). Value is defined as the extent to which a person perceives a certain task as (intrinsically) joyful, valuable, pleasant, and has interest in the task. Procrastination is the personal trait or tendency of a person to delay study activities that have to be completed (Schraw et al., 2007). Self-confidence is the extent to which students belief they will be successful in their study (Beekhoven et al., 2002; McKenzie & Schweitzer, 2001).

Deep approach to learning, the third concept, is the intention of a student to understand learning tasks, combined with specific learning activities (e.g., applying ideas, checking evidence, repeating, selecting, relating with previous and new knowledge, structuring) (Entwistle & Peterson, 2004). These three concepts together are components of a characteristic model that Entwistle and Peterson (2004) identify as ‘meaning-directed learning’.

Many studies showed that these components of meaning-directed learning have impact on academic achievement (e.g., Bruinsma, 2004; Entwistle & Peterson, 2004; Vermunt, 2005). For example, a high degree of value and a low degree of procrastination are related to academic achievement in terms of course grades, completion of assignments, or overall achievement (e.g., Bruinsma, 2004; Eccles & Wigfield, 2002; Schraw et al., 2007). Also, a deep approach to learning positively impacts on academic achievement (Entwistle & Peterson, 2004; Vermunt, 2005), although Bruinsma (2004) found a negative relationship in this respect. Students who show self-confidence are more self-regulating and deep approach-learners (Pajares, 1997; Zimmermann, 2000), and attain a higher academic achievement level (Hattie, 2009; Pajares, 1997).

Integration, meaning-directed learning, and study progress

Social integration, academic integration, and meaning-directed learning are related to study progress. Figure 8.1 depicts the relationships between these concepts.

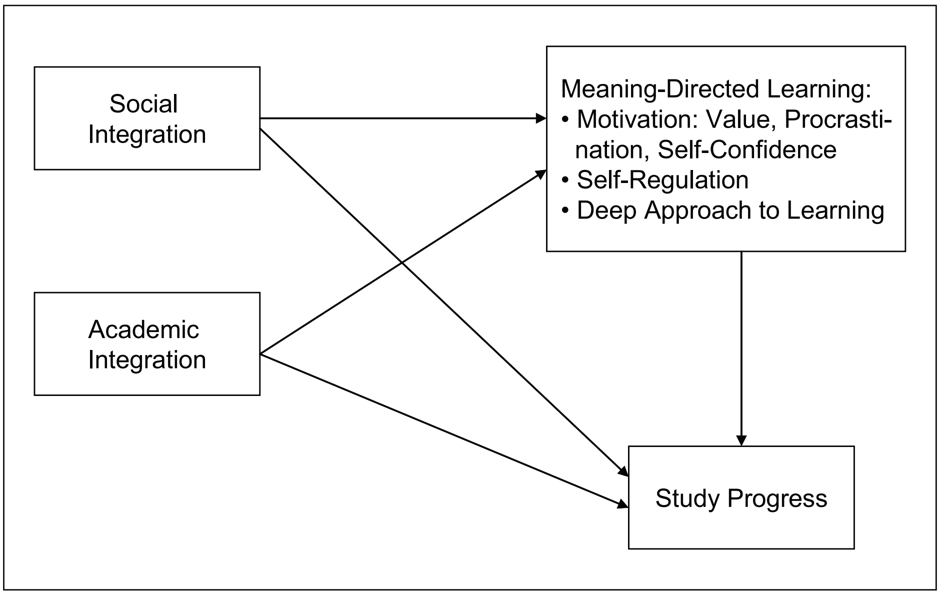


Figure 8.1: Conceptual Model: Meaning-Directed Learning as Mediator of the Influence of Social and Academic Integration on Study Progress

The Figure shows that social and academic integration influence meaning-directed learning as well as students' study progress. Furthermore, several aspects of meaning-directed learning mediate the influence of social and academic integration on study progress (Braxton et al., 2004; Severiens & Wolff, 2008).

Research question and hypotheses

As a consequence of the foregoing we formulated the following research question: What are the relationships between social and academic integration, meaning-directed learning, self-confidence, and earned credits? We will test two hypotheses:

Hypothesis 1: Social and academic integration positively affect meaning directed-learning.

Hypothesis 2: Meaning-directed learning will have a positive influence on earned credits and, thus, are mediators of the influence of social and academic integration on earned credits.

8.3 Method

Population and sample

Data were used of first-year university students of three Higher Vocational Education Institutions. The programmes of these institutions use forms of active constructivist learning, in which approaches such as cooperative learning, collaborative learning, project-based learning, or problem-based learning have a central place. Students are confronted with the didactical elaboration of these approaches in the daily practice of working groups, tutor groups, assignments, skills training, and assessments.

Three months before the end of the first year an online questionnaire on learning and motivation was administered to a pool of 3.072 students who previously participated in a first-year experience survey on social and academic integration. The sample consisted of 786 students who responded to this questionnaire (response = 25.6%). The net sample included 469 women (68%), 114 minority students (17%), 275 students in economics (40%), 186 students in health care, social studies and teacher training (42%), 109 students in engineering (16%), and 16 arts students (3%). The average age of the sample was 19.3 years. The characteristics of the sample matched with the diversity of first-year students in the three institutions, although women, and younger students, were a little overrepresented.

After the end of the academic year, the student administrations provided information on students' number of credits attained during the first year. Table 8.1 shows that, on average, the freshmen had earned 53 credits after closure of the academic year. Good performers were a little overrepresented in the sample.

We merged the three data sets on integration, learning and motivation, and earned credits, into one data file. Before further analysis the data were made anonymous.

Instruments

Students were asked to fill out a questionnaire which addressed their experiences after three months in the first year of higher education. The questionnaire included questions about the extent to which they felt socially and academically integrated. Social and academic integration were measured by seven items (Appendix C.1), which could be rated on a five-point (1 — 5) Likert scale. After nine months of study, the respondents were asked to provide information on aspects of their learning and motivation at that moment. Self-regulation, value, procrastination, self-confidence, and deep approach to learning, were measured with 31 items which could be rated on a four-point (1 — 4) Likert scale. A high score (= 4) indicated that an item was highly applicable to a respondent. The items on self-regulation were based on a scale reported by Schwarzer and Jerusalem (1999). The items on value, procrastination, and deep approach to learning were based on a validated self-report questionnaire on deep information processing (Bruinsma, 2004; Schouwenburg 1994). Although Bruinsma's questionnaire had somewhat different theoretical roots than the instruments used by Entwistle and Peterson (2004) and Vermunt (2005), its items on information processing coincided with their understanding of deep approach to learning.

The learning and motivation data were analysed by means of a factor analysis with principal component analysis and varimax rotation. As expected, the five hypothesized factors were established, with factor loadings varying from .40 to .80. The scales were internally consistent, with Cronbach's alphas between .73 and .84, as shown in Table 1 (for all items see Appendix C.2). The table shows that the first-year students felt socially integrated, with a high mean score of 4.16 and also were academically integrated with a mean score of 3.72. The Table also shows that the distinguished meaning-directed learning components have been put to practice to a reasonable degree and led to a satisfactory outcome in terms of credits. On average, students had neutral levels of self-regulation and procrastination (M = 2.83 and 2.71, respectively), but positive levels on value, a deep approach to learning, and self-confidence (M = 2.95, 4.24, and 3.25, respectively).

Table 8.1: Labels, Item Examples, and Psychometric Properties of the Study Variables

Variables	Item	*No* of items	Cronbach's alpha	*M*	*SD*
Social integration	I am satisfied with the good contacts with other students[a]	4	.84	4.16	0.62
Academic Integration	I am satisfied with the teachers support of students in this program[a]	3	.73	3.71	0.65
Self-regulation	I stay focused on my goal and don't allow anything to distract me from my plan of action[b]	6	.82	2.83	0.54
Procrastination	I can't get myself to study hard enough[b]	8	.87	2.71	0.54
Value	My interest in my study is continuously growing[b]	5	.81	3.24	0.48
Deep approach to Learning	I try to relate new concepts that I already know[b]	6	.73	3.25	0.41
Self-confidence	Compared to others I am performing fairly well in this study[b]	6	.73	2.95	0.49
Earned credits		1	-	53.1	8.97

Notes: [a]Response scale 1 (= low) to 5 (=high). [b]Response scale 1 (=low) to 4 (=high).

Analysis

We wanted to test the relationships among social and academic integration, meaning-directed learning factors, and earned credits. First, Spearman's rank correlations between the independent and dependent variables were calculated. We used linear structural analysis (Lisrel 8.52) in order to obtain a more picture of the possible causal relationships between the independent and dependent variables. The covariance matrix was used as input for testing three linear structural models. In the linear structural model, social and academic integration are regarded as the independent variables. The five aspects of meaning-directed learning (value, procrastination, self-confidence; self-regulation; deep approach to learning) are treated as mediating variables. Study progress is the dependent variable.

The goodness of fit statistics used are Chi-square (with p >.05 indicating a good fit), the Root Mean Square Residual (cut-off value < .05), the Standardized Root Means Square Residual (cut-off value < .10), the Non-normed Fit Index (cut-off value > .95), and the Goodness of Fit Index (cut-off value > .95). Along with the ´goodness of fit´ statistics the standardized residuals were inspected (values < 3 standard deviations from zero) (Jöreskog & Sörbom, 1989; Tabachnik & Fidell, 2007). The structural relationships between the observed variables are presented.

8.4 Results

Correlations

First, the correlations between the independent variables and the dependent variables were computed (Table 8.2). The Table shows small correlations of social and academic integration with self-regulation, procrastination, value, and self-confidence, and also a small correlation (r = 0.11 and 0.13) with earned credits. Among the mediating variables, we see a large correlation of self-regulation with procrastination (r = 0.53), medium correlations of self-confidence with procrastination (r = 0.28), and value with approach to deep learning (r = 0.30). Other correlations among the mediating variables are between 0.13 and 0.23. Striking is the absence of correlation of deep approach to learning with social and academic integration as well as earned credits. Self-confidence and procrastination show the largest correlations with earned credits (r = 0.30 and 0.25, respectively). That is, students who tend not to postpone study activities and who are self-confident earn more credits.

Table 8.2: Zero-order Spearman's Rank Correlations among Independent, Mediating, and Dependent Variables

		1	2	3	4	5	6	7	8
	Independent variables								
1.	Social Integration	1							
2.	Academic Integration	,26**	1						
	Mediating variables								
3.	Self-Regulation	,10**	,09*	1					
4.	Procrastination	,08*	,13**	,53**	1				
5.	Value	,23**	,22**	,13**	,17**	1			
6.	Deep Approach to Learning	,04	,05	,23**	,14**	,30**	1		
7.	Self-Confidence	,11**	,13**	,20**	,28**	,18**	,15**	1	
	Dependent variable								
8.	Earned Credits	,11**	,13**	,09**	,25**	,16**	,08	,30**	1

Notes: [a]Listwise N = 669; *p < .05. **p < .01.

Relationships between Integration, Meaning-Directed learning and Earned Credits

We used linear structural analysis in order to examine the relationships. First, we developed a model which represents the relationships between the mediating variables and earned credits. In order of importance, self-confidence, procrastination, value, and self-regulation explained earned credits. Also, the mediating variables were interrelated in several ways. Then, we generated an all inclusive model in which social and academic integration affected mediating variables and earned credits. Initially, the goodness-of-fit indices indicated that the model did not match with the data. However, after stepwise deleting some paths which had large modification indices, a model was accepted which fitted the data reasonably well, with *chi-square* = 19.70, *df* = 14, *p* =. 13972. Also, a Root Mean Square Residual of .0025, a Non-normed Fit Index of 0.99, and a Standardized Root Means Square Residual of .032 indicated a satisfactory fit of the model. The model resulted in 13% explained variance of the dependent variable earned credits. In this model four of the eight predicted influences of integration were confirmed. The direct effects of the model are presented in Figure 8.2.

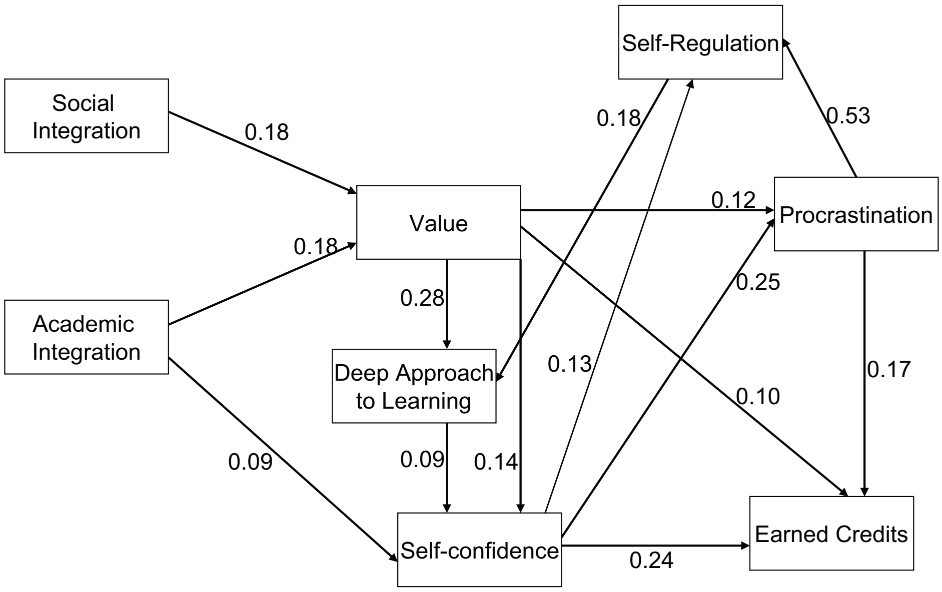


Figure 8.2: Standardised Direct Effects in Accepted Structural-Linear Model with Chi-square = 19.70, df = 14, p =.13972, RMSEA =.0025.

The Figure shows that social and academic integration have significant direct effects on value (standardised coefficients of .18 each). Furthermore, we see a direct path from academic integration to self-confidence (standardised coefficient = .09). Through value and self-confidence, the two aspects of motivation, social and academic integration also influence the other meaning-directed learning variables. Students who are socially and academically integrated will exhibit a higher value, less procrastination, and a higher degree of self-regulation and deep approach to learning. All in all, these results comply with Hypothesis 1.

The right half of the Figure shows that value, self-confidence, and procrastination, exert a direct effect on earned credits (effects of .10, .24, and .17). Self-regulation and deep approach to learning are of secondary importance, partly mediating and/or reinforcing the influence of the more central variables on earned credits. All influences revealed by the model in terms of total, indirect and direct effects are presented in Table 8.3. The Table shows total effects of self-confidence, procrastination, value, deep approach to learning, and self-regulation on earned credits, with standardised coefficients of .28, .17, .16, .02, and .00, respectively. Furthermore, we see, in concordance with Hypothesis 2, an indirect impact of social and academic integration on earned credits, by mediation of value and self-confidence (standardised coefficients .03 and .05), although these influences are small. The indirect effects of social and academic integration by mediation procrastination, self-regulation, and deep approach to learning also are significant, though negligible.

Table 8.3: Standardised Effects for the Accepted Linear Structural Model

		Social Integration	Academic Integration	Self-regulation	Value	Deep Approach to Learning	Self-confidence	Procras-tination
Self-regulation	Total	.02	.03	-	.09	.01	.13	.53
	Indirect	.02	.03	-	.09	.01	-	-
	Direct	-	-	-	-	-	.13	.53
Procras-tination	Total	.03	.05	-	.16	.02	.25	-
	Indirect	.03	.05	-	.04	.02	-	-
	Direct	-	-	-	.12	-	.25	-
Value	Total	.18	.18	-	-	-	-	-
	Indirect	-	-	-	-	-	-	-
	Direct	.18	.18	-	-	-	-	-
Deep Approach to Learning	Total	.05	.05	.18	.29	-	.02	.10
	Indirect	.05	.05	-	.02	-	.02	.10
	Direct	-	-	.18	.28	-	-	-
Self-confidence	Total	.03	.12	.02	.16	.09	-	.01
	Indirect	.03	.03	.02	.03	-	-	.01
	Direct	-	.09	-	.13	.09	-	-
Earned Credits	Total	.03	.05	.01	.16	.02	.28	.17
	Indirect	.03	.05	.01	.06	.02	.04	-
	Direct	-	-	-	.10	-	.24	.17

8.5 Conclusion

The research question of the paper was: "What are the relationships between integration, meaning-directed learning, self-confidence, and earned credits?"

We first hypothesized that the levels of social and academic integration have bearing for the meaning-directed learning variables as well as self-confidence. This hypothesis was confirmed. We particularly saw direct influences of social and academic integration on value and self-confidence. The variables which are characteristic for meaning directed learning, namely deep approach to learning, procrastination and self-regulation, were only indirectly through value and self-confidence, affected by social and academic integration.

Our second hypothesis was that meaning-directed learning variables as well as self-confidence and procrastination are mediators of the impact of social and academic integration on the number of earned credits. The results indicate a partial confirmation of this hypothesis. The apparent central position of value and self-confidence in the model contributes to the finding that these two variables are, together with procrastination, predictors of earned credits. However, the influence of social and academic integration is relatively small. Furthermore, self-regulation and deep approach to learning hardly have impact on students' study progress in the tested model.

8.6 Discussion

In this paper we argued that motivation and learning as well as interactionalist theories, might be more valuable by linking the concepts of social and academic integration to psychological factors, such as self-regulation, procrastination, value, deep approach to learning, and self-confidence (Braxton et al., 1997; Severiens & Wolff, 2009; Stage, 1989; Tinto, 1993). We regarded these psychological variables as mediators between integration and earned credits. The results show that, indeed, social and academic integration influence study progress of first-year students through these variables. Value is affected by social and academic integration, and self-confidence is affected by academic integration. Value and self-confidence directly and indirectly, through mediation, of procrastination, self-regulation and deep approach to learning, impact on study progress. Social and academic integration indirectly exhibit a small influence on study progress, mainly through mediation by value and self-confidence; its mediation effects on study progress through procrastination, self-regulation, and deep approach to learning are negligible in our model. This finding contrasts with research in which meaning-directed learning was found to affect academic achievement (Entwistle & Peterson, 2004; Vermunt, 2005).

Although we could not reject the two hypotheses of this study, the evidence for the influence of social processes on meaning-directed learning is not overwhelming. Several explanations are possible for this result. It could be that first-year students do not really differentiate between aspects of their learning process. The average age of the respondents is 19 years. A substantial number of students are not older than 17 or 18 years when they begin their career in higher education. Although they got acquainted with active learning environments during the last two or three years of secondary education, first-year students may prefer surface study strategies, because they are not yet ready for self-regulation and deep approach to learning. Many of them prefer to execute assignments as they are instructed by educators or syllabi, and to learn subject matter by heart instead of being enterprising. This attitude may be related to the many competing social and cognitive stimuli they have to deal with as a student.

In addition, it could be that the institutions' initiatives of fostering students' social and academic integration are more inclined to social activities outside the classroom which are aimed to retention, than to social processes related to learning activities inside the classroom which are conducive to academic achievement (Arum & Roksa, 2012). Although Dutch higher education institutions today, under pressure of the public discussion on higher education effectiveness, are raising the number of active contact hours.

Another explanation could be that the concepts of social and academic integration in the present study are only a proxy for the social processes taking place in a programme, rather than a good measure of these processes. We measured social integration on a general level, with items about 'quality of contacts with peers', 'appreciation of the type of students in the program', and 'perceived possibility of friendships among classmates'. The 'how' and 'what' of students' contacts and interactions remained out of sight in this definition. Previous research showed that the social processes inside the classroom directly and indirectly, e.g., through social integration and learning, affect academic achievement. For example, Lubbers (2004) showed that sense of belonging mediated the acceptance and friendships rates in secondary education on students' engagement, e.g., in terms of motivation and integrative strategy use. Directly and through these mediators, peer relations affected academic achievement in Lubbers' study. Similarly, the interaction processes among educators and students can affect academic integration, but may have a stronger direct influence on academic achievement. Academic integration was measured on a general level as 'support provided by teachers', 'quality of the contacts with teachers', and 'appreciation of the pedagogic model', but not specified in types of interaction, for example in terms of autonomy support, emotional support, providing structure and feedback with regard to knowledge and skills, or responsiveness to help seeking behavior

(Reeve, 2009; Vansteenkiste et al., 2012)). These processes may affect academic integration, students' motivation and self-confidence as well as their way of learning (Pajares, 1997; Schunk, 2012).

Thus, an alternative model for further research could be one in which the interactions of students with faculty and among peers are both influencing social and academic integration as well as student learning. Further research could also pay more attention to the influence of students' background characteristics on the strengths of the relationships among the variables of the present study. E.g., gender (Astin, 1993; Braxton, 2004; Dekker, Krabbendam, Boschloo, De Groot, & Jolles, 2012; Freudenthaler, Spinath, & Neubauer, 2008; Pascarella & Terenzini, 2005; Seymour & Hewitt, 1997), ethnicity (Braxton, 2004; Eimers & Pike, 1997; Meeuwisse, Severiens, & Born, 2010; Nora, Cabrera, Hagedorn, & Pascarella, 1996; Stark, 2011), and socioeconomic status (Lubbers, 2004) may be moderators of the relationships between integration, meaning directed learning, and study progress.

8.7 Practical implications

To achieve student engagement, educators support students' intrinsic motivation, self-confidence and self-regulation. To retain students, it is important to develop an institutional climate in which students have a sense of belonging. They do this by involving students in terms of academic and social integration. However, involvement is not the same as engagement. The development of an institutional climate in which students have a sense of belonging and well-being in terms of integration does not automatically mean students will deploy active study strategies. The challenge for higher education institutions is to align both types of goals: Engaging students in learning and retaining of students. As a consequence, institutional research has to address social and academic integration as well as motivation and learning.

Chapter 9 Summary, conclusions and implications

This chapter contains an overview of the general problem and aim of this dissertation, the three overarching research questions, the theoretical framework, and the design of the five empirical studies (Section 9.1). A summary of the major results (Section 9.2) provides answers to the research questions. After detailing the limitations of the design of the five studies (Section 9.3), this chapter ends with a summary of the theoretical (Section 9.4) and practical (Section 9.5) implications of the findings in this dissertation.

9.1 Introduction

The general problem addressed by this dissertation is the low academic success of students—measured in terms of *study progress*, *dropout*, and *perceived competence* (Braxton et al., 2000; Eccles & Wigfield, 2002; Entwistle & Peterson, 2004; Terenzini & Pascarella, 2005; Tinto, 1993)—in universities of applied sciences in the Netherlands. Study progress refers to the number of credits attained by students at the end of their first year, after the deadline for exams, re-sits, and assignments. Dropout occurs when a student does not continue the same programme in a following year. On a programme level, dropout is the percentage of students in a cohort that leaves during or at the end of the first year and does not continue in the following year (cf. Berger & Lyon, 2005; NVAO, 2012). Students who switch within or between institutions are not regarded dropouts on the institutional or system level, but current designs of accreditation programmes only account for dropouts and study progress on the programme level.

An overview of developments in dropout rates and study progress highlights the urgency of the need to improve the effectiveness of higher education. In 2005–2010, 16–18% of enrolled students left higher vocational education before their graduation. Two-thirds of these dropouts occurred in the first year. On the level of institutions and programs, this percentage was considerably higher. First-year dropout rates in the institutions from which the sample for this dissertation came were 35%. Furthermore, in 2005–2010, students who did not leave the programme graduated after 51 months. Even dropout students stayed in the programme for a long period, averaging 25 months.

The third indicator of academic success was perceived competence, defined as the self-assessed capacity of first-year students to execute professional tasks, independently or in cooperation with other students, and to clearly communicate these capabilities to others. As a central concept in higher vocational education, competence is the qualitative equivalent of earned credits. For reasons related to definitions and measurement, the concept of competence appears less frequently in research into effectiveness in higher vocational education.

This dissertation has sought to examine the precise influence of psychological and interactionalist factors and thereby propose potential methods to increase effectiveness in Dutch higher vocational education for first-year students. In interactionalist approaches, students' interactions with peers and faculty determine their level of social and academic integration and their commitment to the institution; these factors have impacts on students' persistence and study progress (Braxton et al., 2004; Tinto, 1993). In line with psychological approaches, aspects of motivation and learning can explain first-year academic success (Bandura, 1997; Entwistle & Peterson, 2004; Lonka et al., 2004; Pintrich & De Groot, 1990; Ryan & Deci, 2000). In particular, meaning-directed learning, which connects three motivation aspects (value, procrastination, and self-confidence) to self-regulation and deep approaches to learning prove viable and effective in relation to academic success (Entwistle & Peterson, 2004). Within the framework of these theories, three overarching research questions emerged:

1. Which factors pertaining to psychological and interactionalist approaches help explain the academic success of first-year students?
2. Does a combination of psychological and interactionalist factors offer added value for explaining academic success?
3. Do factors related to academic success work the same way in different environments and for different groups?

For the psychological approach followed in Chapters 4 and 5, the main variables examined in relation to perceived competence and/or earned credits were self-efficacy, self-regulation, value, expectancy of procrastination, anxiety, self-confidence, and a deep approach to learning. For the interactionalist approach in Chapters 6 and 7, the examination focused on the relationships of individual background variables (secondary education, math GPA, preparation of active learning skills, preparation of academic knowledge and skills) and engagement variables (attendance of contact hours, independent study hours, satisfaction with active learning, satisfaction with academic knowledge and skills, social integration, academic integration, intention to persist), in relation to dropout rates and earned credits. Finally, Chapter 8 combined these two approaches to derive an improved model to explain first-year academic success. The theoretical concepts can be combined in one model (Figure 9.1).

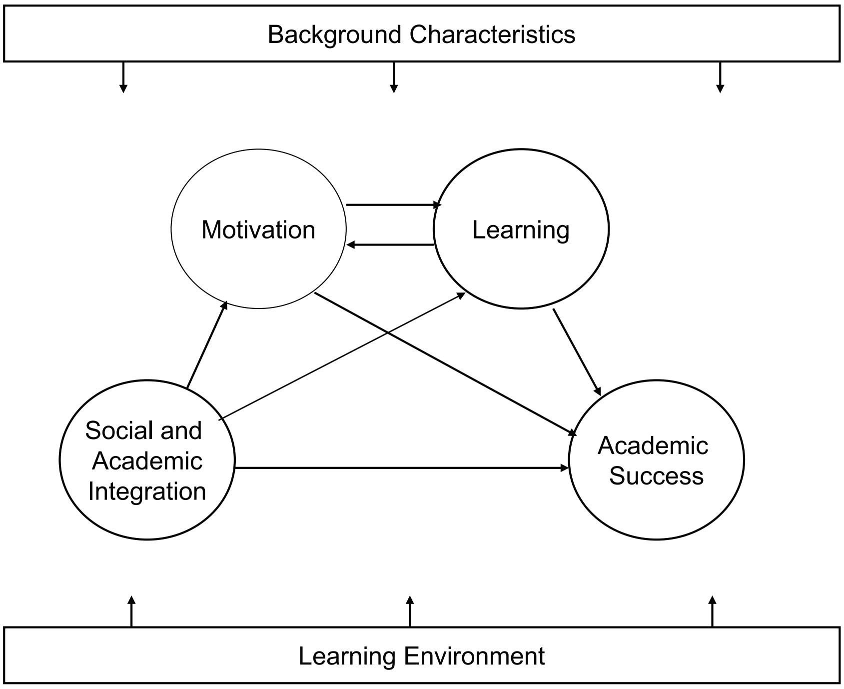


Figure 9.1: Conceptual Model Integrating the Interactionalist Approach (Social & Academic Integration) and Psychological Approach (Motivation & Learning) to Describe Influences on First-Year Academic Success

In this model, social and academic integration (interactionalist approach) have influences on academic success. An increase in the level of social and academic integration is followed by an increase in academic success. Part of this influence is indirect, through motivation and learning variables (psychological approach). Furthermore, the relationships among these variables differ according to the individual and learning environment variables.

The data for the five studies in this dissertation were collected with two different questionnaires, gathered from first-year students of five universities of applied sciences in the north-eastern part of the Netherlands. One questionnaire, administered among first-year students of the 2008–09 cohort who enrolled in higher education for the first time, was based on an interactionalist approach with items about individual student backgrounds and engagement. A second questionnaire, administered among first-year cohorts in three universities of applied sciences enrolled in 2006–07 and 2008–09, reflected a psychological perspective, pertaining to first-year students' perceptions of their motivation and learning strategies, as well as their actual study behavior. These data sets then were linked to dropout and study progress data for the respondents. The data analysis strategy in each chapter consisted of descriptive statistics, principal components and reliability analyses, correlations, and linear structural modeling.

9.2 Summary of results

Factors of different theories

In the main model, study progress was the variable to be explained, using four psychological variables (Chapter 4). In a descending order of influence, procrastination, self-regulation, value, and perceived competence explained earned credits. In contrast, the alternative to the main model showed that value and self-regulation were the most important factors for explaining perceived competence, followed by a deep approach to learning and then earned credits. In both models, the relationship between earned credits and perceived competence was weaker than might be expected in programmes that award credits on the basis of acquired competence. A second study extended these psychological models with self-efficacy, anxiety, and self-confidence variables (Chapter 5). In this extended model, self-confidence was the most important factor for explaining study progress, followed by value, procrastination, and self-efficacy. Deep approach to learning, self-regulation, and anxiety did not affect study progress. In the model developed and tested in Chapter 8, self-confidence, procrastination, and value were the three main explanatory factors for study progress. The influences of self-regulation and deep approaches to learning were minor. These results are summarised in Table 9.1.

Table 9.1: Psychological Factors Affecting Study Progress, in Order of Importance

Chapter	Variables
4	Procrastination, self-regulation, value/perceived competence
5	Self-confidence, value, procrastination, self-efficacy
8	Self-confidence, procrastination, value

As a partial answer to the first research question, the effects of value, self-confidence, and procrastination on study progress remained fairly consistent across various models. The effects of a deep approach to learning and self-regulation were smaller (Chapter 8) or almost absent (Chapter 5) in models that used study progress as the dependent variable.

In the interactionalist models, the intention to persist in the same programme was by far the most important influence on study progress and persistence (Chapters 6 and 7). Almost half of the 17% of the respondents in the sample who expressed doubts about staying dropped out after their first year. The influence of other factors related to background, preparation, and transition were smaller. In descending order, satisfaction with active learning, satisfaction with knowledge and skills, integration, preparation in active learning, independent study, gender, preparation of academic knowledge and skills, contact hours, and prior education influenced study progress. Most of these influences were indirect, through intentions to persist, satisfaction, or integration. The second part of the answer to the first research question thus was that a student's intention to persist came up as the most important factor responsible for individual differences in academic success. However, other factors within the sphere of influence of a programme or institution (e.g., satisfaction with active learning, satisfaction with knowledge and skills, contact hours, social and academic integration) had reinforcing effects on this main factor and affected academic success indirectly.

Combining psychological and interactionalist factors

A model that combines psychological and interactionalist factors to explain first-year study progress was tested (Chapter 8). The analysis of the model showed that the indirect influence of social and academic integration on first-year study progress, through self-regulation and a deep approach to learning, was negligible. Self-regulation and deep approaches to learning were marginally influenced by social and academic integration; accordingly, their influence on study progress was small. However, the influences of self-confidence, procrastination, and intrinsic value on study progress were substantial in the combined psychological-interactionalist model, partly due to the influence of social and academic integration on these variables. The indirect influences of social and academic integration on study progress also were significant, though small. For the second research question, these results imply that combining factors from different theoretical foundations can improve explanations of first-year academic success in higher vocational education, beyond the use of factors rooted in only one approach.

Differences across disciplines and groups

This dissertation also examined whether the factors distinguished in psychological and interactionalist models function in the same way for first-year students with different ethnic backgrounds or different genders, studying in different disciplines. The influences of motivational beliefs and deep approaches to learning on study progress, compared across minority and majority students (Chapter 5), showed that self-confidence and value were important, regardless of the students' backgrounds. Among minority students, anxiety influenced procrastination (lower anxiety induced more procrastination), but neither of these variables affected study progress. Nor did self-regulation or a deep approach to learning have influences on minorities' study progress. However, self-efficacy (indirectly), value, and self-confidence (directly) affected the study progress of this minority group. For majority students, self-efficacy reduced anxiety; anxiety negatively affected a deep approach to learning (less anxious students exhibited less deep approaches to learning); and self-regulation positively affected deep approaches to learning. However, with the exception of a small negative effect of self-efficacy, these factors did not affect study progress among majority students. Self-confidence was the most important factor explaining study progress, and procrastination and value ranked second and third in terms of influencing study progress in this group.

A comparison of male and female first-year students in engineering programmes showed that women scored higher on time spent on independent study, social integration, earned credits, and retention (Chapter 6). Preparation in active learning negatively affected women's academic success. Furthermore, independent study affected the attainment of credits and, to a smaller extent, the persistence of female students, but not of male students. Women appeared sensitive to their interactions with faculty, such that academic integration affected their study progress and staying. This effect was weaker for male students' academic success. Social integration affected the academic success of both gender groups—contrary to the hypothesis that this relationship might be more important for men than for women. Further analysis also indicated that gender and the type of secondary education have different indirect influences on study progress across disciplines (Chapter 7).

Finally, a general interactionalist model, developed and tested for the disciplines economics, engineering, health care, and social studies (Chapter 7), showed that across the board, intention to stay was the best predictor of study progress. It also mediated the influences of satisfaction with active learning, satisfaction with academic knowledge and skills, and social and academic integration on study progress. The influence of other factors on study progress in the general model varied across disciplines, such as attendance at contact hours (important in health care, social studies), independent study (important in economics, health care), gender (women in economics, engineering, and health care perform better), and preparation in active learning (negative effect in economics, engineering, and social studies). The general model thus supported the identification of factors important for study progress, but specifications of the relationships in four disciplines resulted in better indications of which factors explain the lack of academic success. The key results are summarised in Table 9.2.

Table 9.2: Factors Affecting Study Progress for Different Groups

Psychological Variables	Minority students	Self-efficacy, value, self-confidence
	Majority students	Self-confidence, procrastination, value
Interactionalist Variables	Female students	Academic integration, intention to persist, preparation in active learning (–), independent study
	Male students	Intention to persist, GPA math, academic integration
	Economics	Intention to persist, satisfaction with active learning, satisfaction with knowledge and skills, integration/ preparation in active learning (–), independent study
	Engineering	Intention to persist, integration, satisfaction with active learning, satisfaction with knowledge and skills
	Health care	Intention to persist, independent study, contact hours
	Social studies	Intention to persist, contact hours, preparation in active learning (–)

In conclusion, as an answer to the third research question, distinguishing student groups according to criteria such as discipline, ethnicity, and gender is important to achieve more valid analyses of the factors that explain academic success. The relationships among variables differ across unique groups and sectors. General explanations are not straightforwardly applicable to all subgroups and environments within an institution.

9.3 Limitations

A primary limitation in this dissertation is the use of cross-sectional designs. A longitudinal design might offer more concrete points in time for group- or discipline-specific interventions. For example, instead of measuring intentions to persist at one moment, three months into the first year, it might be insightful to examine how these intentions develop over the course of the first year. Other studies show that first-year students consider leaving after Christmas and during the first semester (Thomas, 2012). It is unclear when these questioning students actually decide whether to leave. None of the studies in this dissertation reported whether these students considered switching during their first year. The percentage of students who do not intend to stay is probably larger in the real-world population than in the sample, because early dropouts were excluded from the data collection. Non-leavers with no doubts about their study choice likely were overrepresented in the sample.

A limitation concerns the concept of perceived competence. Many authors note the difficulty of deriving a sound definition for competence (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink; Kappe, 2011; Stoof, Martens, Van Merriënboer, & Bastiaens, 2002; Van Merriënboer, Van der Klink, & Hendriks, 2002). Doubts persist about the possibility of applying a generic concept of competence to a range of programmes (Van Merriënboer et al., 2002). For beginning students, professional competence is even more difficult to measure, because the focus of first-year programmes is on fragmented knowledge and skills, rather than on a comprehensive set (Kappe, 2011). Students in later years and advance classes, as well as professionals, can more easily reflect on their competence and apply them in real-life occupational situations. Researchers also question whether competence development can be aptly described as an accumulation of credit points (Sluijsmans et al., 2008). Similar comments also apply to *perceived* competence: the assumption of the reliability of self-assessed competence by students is questionable (Sluijsmans, Straetmans, & Van Merriënboer, 2008). However, in the contexts of the qualification and socialization function of education and the existent competence-based programs, it is a logical step to include this measure of competence in evaluations of educational effectiveness. A related concern is the relatively small number of items used to measure competence, though the Cronbach's alpha was acceptable for this scale. Finally, the measure of competence did not refer to concrete tasks or assessments of knowledge and skills, nor was it based on any observable behavior.

Another limitation pertains to the weak relationships of factors associated with meaning-directed learning and academic success in terms of earned credits. These weak relationships appeared in previous studies too (Bruinsma, 2004; Entwistle & Peterson, 2004; Hattie, 2009). However, when taken together, self-confidence, procrastination, value, and self-efficacy help to lever academic success (Section 9.2) and offer clues for interventions for all or groups of students. Furthermore, this dissertation did not include an organizational perspective on academic success. Extending the proposed models with organizational variables, such as curriculum characteristics (Jansen, 1996; Van den Berg & Hofman, 2005), the composition of the student population (Severiens & Ten Dam, 2012; Mastekaasa & Smeby, 2008; Tison, Bateman, & Culver, 2011), or student–teacher ratios might offer higher proportions of explained variance. However, missing data on the individual and aggregate levels inhibited such a multilevel design.

A final issue is the sample size of the studies, which varied between 21% and 30% of the population. Good students tend to be overrepresented when the percentage of respondents is small (Kamphorst & Oostindiër, 2008).

9.4 Theoretical implications

Combining factors originating in different theoretical approaches can improve explanations of academic success in higher education (cf. Beekhoven et al., 2002; Braxton et al., 1997; Bruinsma, 2003; Torenbeek, 2011). This dissertation evidenced that psychological and interactionalist models help to explain first-year academic success in higher education. However, it seems difficult to draw a conclusion about which of the two models is preferable for determining academic success. Instead, it was argued that a conceptual model that combines both approaches is more appropriate. Chapter 8 presents this combined interactionalist–psychological model and demonstrates that the interactionalist variables social and academic integration have indirect influences on academic success through several psychological variables, such as value and self-confidence. Therefore, continued research on academic success should use similar combined models.

In line with the pleas for further research on the influences of higher vocational education on a broader spectrum of often competing outcomes (cf. Borghans et al., 2008; Covington, 2000; Kappe, 2011; Pascarella & Terenzini, 2005; Terlouw, 2012), this dissertation examines the relationship between first-year students' perceived competence and earned credits. This relationship was weaker than might be expected in competence-based learning environments, and its fostered characteristics of constructivist learning (self-regulation, value, and deep approach to learning) have different influences on earned credits than on perceived competence. More research is needed into the development of perceived competence, its relationship with observed professional competence, knowledge, and skills, as expressed in earned credits, and how constructivist learning environments enhance perceived competence. Continued research would also benefit from a more differentiated measurement of perceived competence with more items in order to come to a broader content coverage of the concept and more clear distinctions among groups of students and years.

Despite these doubts, the concept of perceived competence remains important for the qualification and socialization function of education. Perceived competence is an expression of a person's self-efficacy and self-confidence in an educational or vocational context; self-efficacy and self-confidence in turn are good predictors of academic success (Bandura, 1997; Hommes, 2006; Prins, 1997). A student's perceived competence affects the decision to stay or leave during the first-year. Furthermore, competence takes a central role in current constructivist approaches to teaching and learning in higher vocational education. This dissertation contributes to more knowledge about students' perceptions of competence in the first year. Characteristics of constructivist learning (self-regulation, value, deep approach to learning) affect perceived competence, but more research is needed into the perceived competence of first-year students and how it relates to observed professional competence, knowledge and skills, and earned credits.

Furthermore, little is known about how and in which conditions students develop competence during a bachelor programme. Further research should address the influences of higher vocational education on a broad spectrum of competing outcomes, including competence and earned credits (cf. Borghans et al., 2008; Covington, 2000; Pascarella & Terenzini, 2005; Phan, 2010; Terlouw, 2012). For this purpose, it would be useful to measure perceived competence with more items, to achieve a broader content coverage of the concept and more differentiation in groups of students and years.

Further (institutional) research also should focus more on the question of the influence of innovations that have been designed to improve the academic success of first-year students in higher vocational education. This dissertation has shown that the influence of several factors on first-year academic success are smaller or contrary to conventional expectations, such as the near-absence of effects of a deep approach to learning and self-regulation, the negative effect of math GPA and preparation in active learning among female engineering students, and the small effect of contact hours on study progress in economic programmes. Additional research could provide more evidence related to first-year educational innovations. The findings may be at odds with existing expectations about the outcomes of first-year innovations.

Finally, the relationships among a range of factors and their impacts on academic success differ across distinct groups in the student population. The distinct variables relate differently across ethnic groups (Boekaerts, 1999) and genders (Felder & Brent, 2005; Seymour & Hewitt, 1997). Further research must continue to address such differences in individual characteristics in relation to first-year academic success. Pascarella and Terenzini (2005) thus refer to the 'conditional effects' question. Such research might include differences among first-year students from different secondary education tracks, compare first- and second-generation students from more educated families, consider students who drop out voluntarily or involuntarily, or address distinctions among excellent, mainstream, and lagging students. In a similar vein, institutional research could consider disciplinary differences in explanations of academic success (Becher, 1994). Pascarella and Terenzini (2005) refer to these distinctions as the 'within-college effects' question. Variation in the preparation levels of students, due to differences in their preceding schooling, also could be included in this approach (Torenbeek, 2011). Beyond the quantitative approach adopted in this dissertation, qualitative research designs might provide more detailed insights into factors that affect study progress and the dropout of higher vocational education students.

9.5 Practical implications

Although many studies and many interventions apply at the levels of programs, institutions, and overall systems of higher education, poor effectiveness continues to represent a stubborn problem for higher vocational education in the Netherlands. A few practical lessons at the macro-, intermediate-, and micro-levels of higher education emerge from this dissertation though (Jansen & Terlouw, 2009).

The Dutch debate about outcomes of higher vocational education reflects, as noted by researchers, the weakness of the link between earned credits and students' competence levels. Accreditation committees have reported that in several bachelor programs, the quality of more than 15% of theses—which should be a substantial element in any proof of competence—was below the minimum standard (Inspectie van het Onderwijs, 2011). Yet these students still earned credits for their assignments and graduated. In accordance with the discussions among researchers, several overlapping explanations are possible. Educators and accreditation committees may have different interpretations of the concept of competence, such that accreditation criteria for professional competence are applied too rigidly. Also, educators in different disciplines likely use different standards, sometimes based on an accumulation of credits earned for modules and courses, and sometimes based more on a holistic concept of competence. If competence is an important objective in vocational education, educational practitioners must use a clear definition, have a view on how students develop competence during the programme, and anchor competence in the assessment system.

Institutions in higher vocational education should account for the varying relationships among psychological and interactionalist variables and of these variables with academic success across groups and disciplines. Results found in one context cannot be applied directly to another context. Before undertaking large-scale implementations of new policies or interventions, practitioners need to conduct empirical checks of their effectiveness, across multiple contexts and groups. For example, we saw that an increase in contact hours affected first-year study progress differently across disciplines; other research has suggested that this effect even can be negative (e.g., Schmidt et al., 2010). Similarly, type of secondary school, preparation in active learning, academic knowledge and skills, satisfaction, and social and academic integration all have varying effects on study progress, according to discipline or gender. Therefore, generic, first-year interventions defined at an institutional level for all departments and student groups likely lead to suboptimal results and undesired effects. No blueprints for student success exist (Kuh et al., 2010).

Instead, institutions and programmes should analyze group- and discipline-specific data (Posey & Wijesinghe, 2012; Saupe, 1990) to determine whether performance indicators and underlying variables reach certain levels, as well as whether and how these variables affect specific college outcomes. If their impact is relatively low or inconsistent across disciplines or groups, they require closer specification, exclusion, or replacement. Institutions also should consider monitoring how performance indicators develop over time. For example, intentions to leave might reach several peaks in the course of a year (Thomas, 2012), which demand actions at appropriate moments. In a similar way, self-efficacy, motivation, or the use of deep approaches to learning and self-regulation strategies can vary over time. As Terlouw (2012) has suggested, institutions should account for the multifaceted character of explanations of academic success. Isolated interventions do not work; arrangements of appropriate actions require the joint involvement of institutions of higher vocational education and secondary schools. For first-year students, such joint involvement could ensure the provision of information about programs, study choice conversations, study counselling, feedback, learning and study skills support, and support for disabilities through consistent packages of action. These arrangements should be monitored and improved in accordance with available empirical evidence.

In the classroom, teachers must realize that they are key to students' positive interactions with their learning environment and their sense of belonging. In Tinto's (1993) model, the social and academic integration of students is central. This dissertation confirms that academic integration has a significant influence on students' motivation, self-confidence, procrastination, and academic success. Teachers can use this knowledge during interactions with and in support of students, in and outside the classroom. Anecdotal evidence and research both indicate that teachers can be trained in 'good' skills (Andrews, Clark, & Thomas, 2012; Pascarella & Terenzini, 2005), such as using active and collaborative learning strategies, dealing with diversity, providing appropriate learning support and feedback, creating learning communities, and ensuring safe learning environments (Chickering & Gamson, 1987; Hattie, 2007; Kuh et al., 2007; Kuh et al., 2010; Pascarella & Terenzini, 2005).

The results of this dissertation also confirm that interventions to influence individual student psychological factors (micro-level) remain important. Interventions to help students choose the right programme should provide appropriate information about the supply and contents of higher education, equip them with knowledge and skills that enable them to select programmes according to their preferences, encourage appropriate expectations, and facilitate early engagement with older students and faculty (Hossler, Schmitt, & Vesper, 1999; Thomas, 2012). In this regard, practitioners in secondary and higher vocational education need to align their interventions (as in the previously mentioned joint arrangements).

Finally, many interventions designed to support students during the first months of their first year in higher vocational education focus on engagement (e.g., Kuh et al., 2007) or 'sense of belonging' (Hurtado & Carter, 1997; Meeuwisse et al., 2010; Thomas, 2012). These interventions include social interactions with faculty and students, within and outside the classroom, which can enhance social and academic integration, attendance at classes and independent study, and deployment of good learning and motivation strategies (Kuh et al., 2010; Tinto, 1993, 2012; Thomas, 2012). These interventions also help reinforce or establish students' intentions to stay—the single most important factor for study progress and persistence. Although for some groups, such as female engineering students, appropriate study choices and intentions to persist arise from the very start of the first year (Chapter 7), for many others, these intentions form during the first few months in higher education. Thus, students' intentions to persist might leverage dropout rates. To establish or reinforce students' intentions to persist, practitioners should provide support to those students who express doubts about their choices, through mentoring and study guidance. The influences that students experience from the institution, teachers, and peers, as well as the study behavior they deploy and learn to appreciate during the early phases of their first year, may help increase the effectiveness of higher vocational education institutions.

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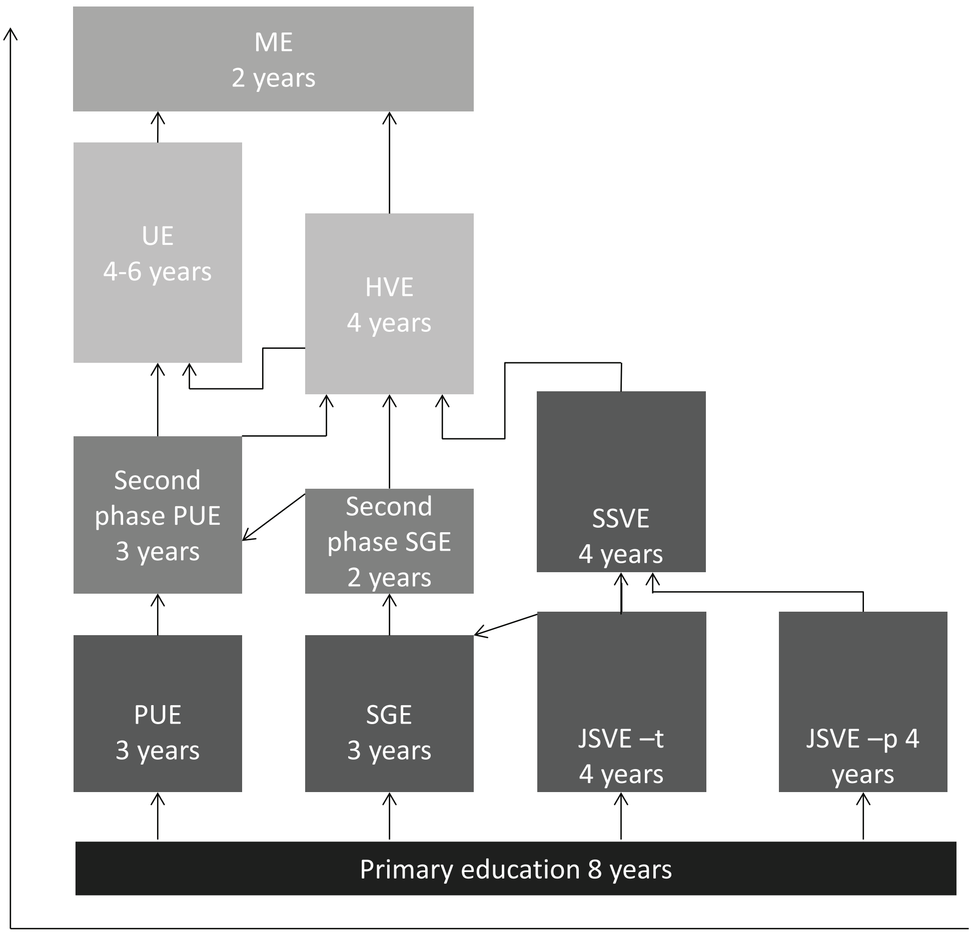
Appendix A.

In the Netherlands, three types of secondary education give access to higher vocational education (universities of applied sciences): preparatory university education (PUE, six years), senior general secondary education (SGE, five years), and senior secondary vocational education (SSVE, four years after four years junior secondary vocational education) (Figure 1).



Notes: PUE = preparatory university education; SGE = senior general secondary education; SSVE = senior secondary vocational education; JSVE-t or -p = junior secondary vocational education-theoretical/practical stream; HVE = higher vocational education; UE = university education; ME = master education.

Figure 1: Educational System in the Netherlands

The majority of the students who start in higher vocational education graduated in SGE (60%) or SSVE (30%). About 10% of first year population in higher vocational education graduated in PUE. On average SGE-graduates in the first year of higher education are 17 to 18 years, PUE-graduates are 18 to 19 years and on an average SSVE- graduates are 20 to 22 years of age.

In the last three or two years of PUE and SGE students can choose different profiles. N-profiles (nature & technology or nature & health) prepare for studies in science, technology, engineering and mathematics, or for health profession studies. S-profiles (economics & society or culture & society) prepare for studies such as business administration, international business and languages, communication, social studies. Students with an N-profile are directly admitted to more programmes than students with an S-profile. Students who choose a programme which is not line with their profile can compensate for this before the start or during the first year.

Similarly, SSVE- students in the last two years can choose between four sectors: social work & care, economics, engineering & technology, and agriculture. However, irrespective of the sector, SSVE-students can start with every programme in higher vocational education without extra requirements.

Appendix B Factor Loadings for Principal Components Analysis with Varimax Rotation of Motivation and Learning Scales (Ch. 5 and 8)

	Factor						
Items	1	2	3	4	5	6	7
I study by fits.	.755						
I miss a real incentive to study.	.747						
I can't get myself to study hard enough.	.729						
I don't bother enough about my study.	.725						
I study unsystematically.	.667						
I'm always behind with my study.	.650						
When I study, I have too many other things on my mind.	.643						
I have difficulties sticking to my study plan.	.523						
I sometimes can't get to sleep because I have to think about my study.		.785					
I am afraid I will be seized by panic during examinations.		.754					
I am afraid that all my weak points will show up at examinations.		.723					
At times, I feel struck by panic when studying.		.700					
I often feel too depressed to concentrate on my study.		.622					
I feel guilty when not studying.		.586					
When I start working on a task, I think that I won't be able to manage it.		.504					
When I study, I am not easily distracted.			.767				
I can control my thoughts from distracting me from the task at hand.			.760				
After an interruption, I don't have any problem resuming my concentrated style of studying.			.656				
I can concentrate on an activity for a long time, if necessary.			.656				
I stay focused on my goal and don't allow anything to distract me from my plan of action.			.607				
If an activity arouses my feelings too much, I can calm myself down so that I can continue with the activity soon.			.571				
Thanks to my resourcefulness, I can handle unforeseen situations.				.762			
If I am in trouble, I can think of a good solution.				.754			

Appendix

Items	Factor 1	2	3	4	5	6	7
I am confident that I can deal efficiently with unexpected events.				.689			
When I am confronted with a problem, I can find several solutions.				.653			
I can handle whatever comes my way.				.608			
I can remain calm when facing difficulties because I can rely on my coping abilities.				.596			
My interest in my study is continuously growing.					.812		
I can do what I like in this programme.					.745		
This programme is the road to the right profession for me.					.737		
I enjoy talking about my study to other people.					.730		
Certain aspects of my study are really interesting.					.625		
When I study, I always try to relate different courses.						.681	
It is important for me to understand a line of reasoning and to catch its real meaning.						.677	
I try to relate new concepts to concepts that I already know.						.667	
In order to understand new ideas and theories, I try to relate them to practical situations from daily living.						.661	
Guidelines or ideas often make me think.						.596	
I always try to really understand things.						.466	
I often have difficulties in understanding the learning contents of a course.							.711
I need more time for my study compared to others.							.665
I can handle this study.							.653
The contents of this study are presented in such a complex way that I frequently don't understand it.							.641
Compared to others I am performing fairly well in this study.							.549
Variance explained (%)	17.3	10.2	7.9	6.5	4.1	3.5	3.2
M (*SD*)	2.71 (.54)	2.87 (.38)	2.83 (.54)	2.65 (.47)	3.24 (.48)	3.25 (.41)	2.95 (.49)

Notes: 1 = Procrastination; 2 = Anxiety; 3 = Self-Regulation; 4 = Self-Efficacy; 5 = Value; 6 = Deep Approach to Learning; 7 = Self-Confidence.

Response scales: 1 = totally disagree/not at all true – 4 = totally agree/completely true.

Appendix C Factor loadings for Principal Component Analysis with Varimax Rotation of C.1. Engagement Scales (Ch. 6, 7 and 8)

Items	Factor 1	2	3	4
Reflect on peers' ways of working	.854			
Reflect on ones learning process	.806			
Perform a problem analysis	.725			
Keep record of ones learning process	.689			
Work in groups	.622			
Work on larger assignments	.613	.417		
Writing skills		.761		
Computer skills		.692		
Information skills		.674		
Presentation skills		.577		
Study skills		.566		
Communication skills	.468	.548		
Independent study		.479		
Transfer of subject contents		.427		
Making friends in this institution			.867	
Good contacts with other students			.834	
The type of students in this programme			.807	
The contacts with peers in this programme			.726	
Contacts with lecturers in this programme				.819
The support of students in this programme				.801
The way of working in this programme during the first months				.684

Notes: 1 = Satisfaction with active learning. 2 = Satisfaction with academic knowledge and skills. 3 = Social integration. 4 = Academic integration. Response scales 1 + 2: 1 = "low satisfaction" – 6 = "high satisfaction". Response scales 3 + 4: 1 = "very dissatisfied" – 5 = "very satisfied".

C.2. Preparation Scales (Ch. 6, 7 and 8)

Items	Factor 1	2
Reflect on peers' ways of working	.817	
Reflect on ones learning process	.776	
Work in groups	.674	
Keep record of ones learning process	.663	
Work on larger assignments	.593	
Perform a problem analysis	.570	
Communication skills	.507	.423
Writing skills		.738
Information skills		.645
Knowledge of subject contents		.581
Study skills		.535
Presentation skills	.444	.520
Computer skills		.519
Independent study skills		.404

Notes: 1 = Preparation in active learning. 2 = Preparation in academic knowledge and skills. Response scales: 1 = "there was no time at all for this aspect during secondary education" – 5 = "there was very much time for this aspect during secondary education".

Appendix D (Chapter 7)

Linear structural models for four disciplines

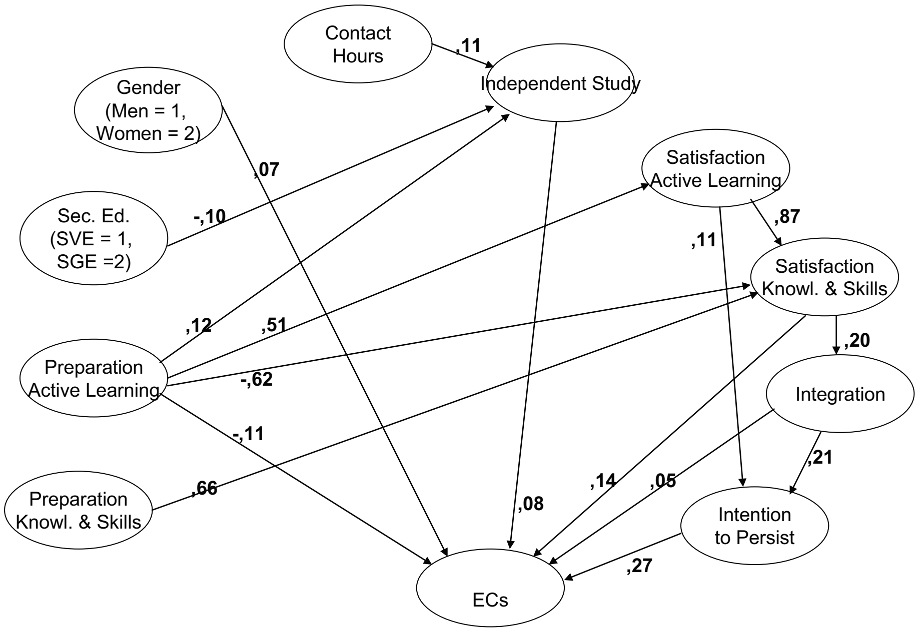


Figure a. Significant Direct Effects: Economics (N = 920; χ^2 = 34.60, p =.54, df = 36)

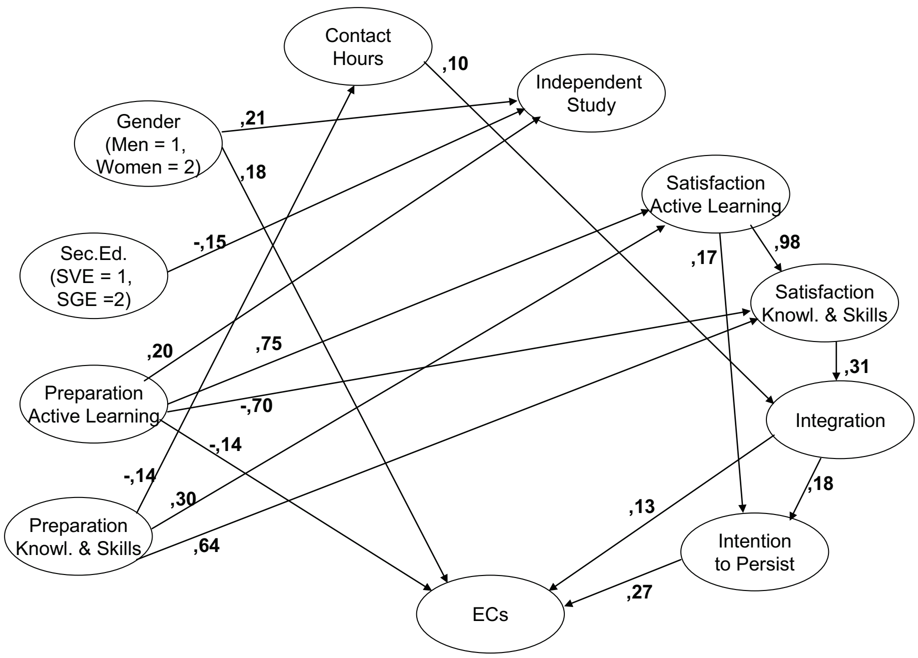


Figure b. Significant Direct Effects: Engineering (N = 313; χ^2 = 28.55, p =.84, df = 37)

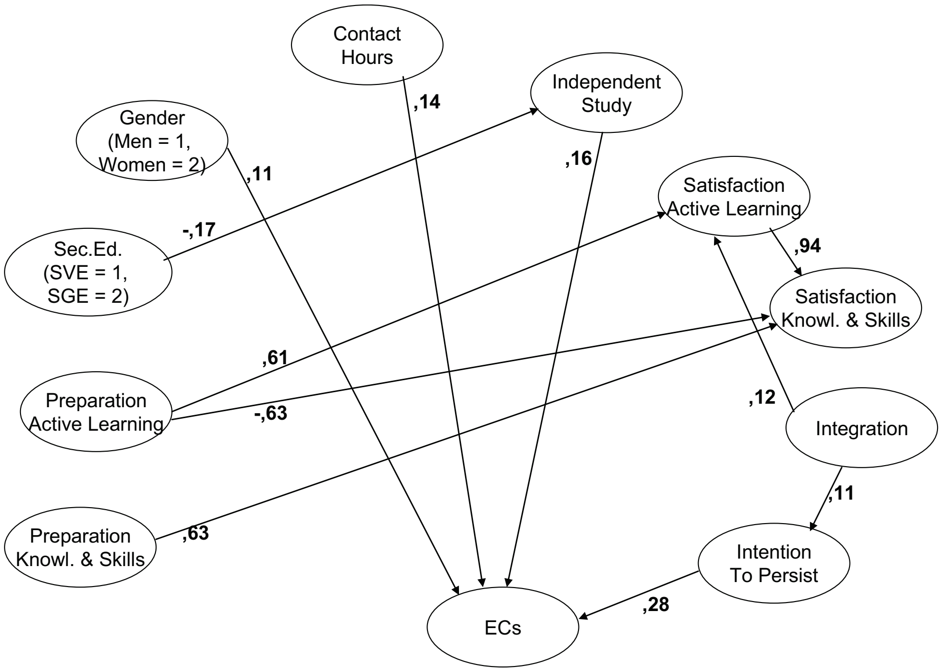


Figure c. Significant Direct Effects: Health care (N = 284; χ^2 = 32.81, p =.62, df = 36)

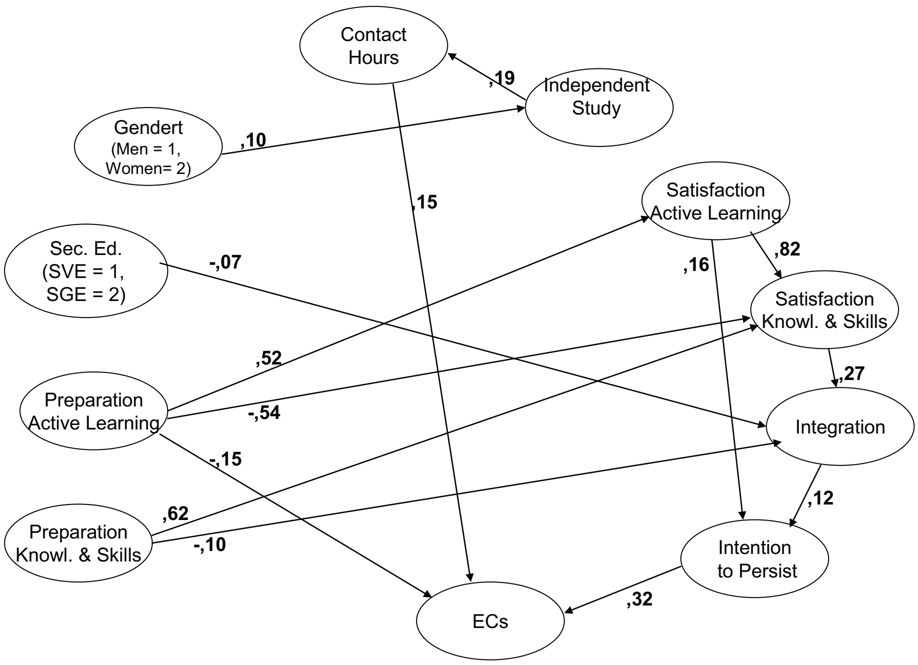


Figure d. Significant Direct Effects: Social studies (N = 359; χ^2 = 49.01, p = .11, df = 38)

Nederlandse samenvatting

Deze samenvatting herhaalt eerst het algemene probleem en het doel van dit proefschrift en de drie overkoepelende onderzoeksvragen (Inleiding). Daarna volgt een overzicht van de theoretische achtergronden van het onderzoek (Theoretische achtergronden). Vervolgens zijn de thema's en het design van de vijf empirische studies beschreven (Opbouw en design). In de conclusies wordt ingegaan op de belangrijkste resultaten die antwoord geven op de drie onderzoeksvragen (Conclusies). Vervolgens worden de beperkingen van de gevolgde methode in de vijf studies besproken (Beperkingen). De samenvatting besluit met de betekenis van het proefschrift voor theorie en verder onderzoek (Theoretische implicaties) en voor de praktijk (Praktische implicaties).

Inleiding

Het algemene probleem dat in dit proefschrift aan de orde komt is de geringe mate van academisch succes van studenten in opleidingen en instellingen in het hoger beroepsonderwijs in Nederland**.** Dit proefschrift richt zich op verklaringen voor het geringe academische succes van eerstejaarsstudenten in hogescholen. Academisch succes is gemeten in termen van *studievoortgang*, *uitval* en *gepercipieerde competentie*. Studievoortgang en uitval vormen indicatoren voor de effectiviteit van de selectiefunctie van hoger onderwijs. Gepercipieerde competentie is een indicator voor de effectiviteit van de kwalificatiefunctie van het hoger onderwijs.

De eerste indicator, studievoortgang, is gedefinieerd als het aantal studiepunten dat studenten hebben behaald aan het eind van het eerste studiejaar, nadat dit jaar formeel is afgesloten op het moment dat de deadline voor tentamens, herkansingen en opdrachten is gepasseerd.

Uitval treedt op wanneer een student niet doorgaat met een opleiding in een volgend cursusjaar. Uitval is gedefinieerd als het percentage studenten van een cohort dat in een propedeusejaar vertrekt en niet meer terugkeert in het tweede jaar van dezelfde opleiding (Berger & Lyon, 2005; NVAO, 2012). Opleidingen hebben te maken met en worden verantwoordelijk gehouden voor uitval en geringe studievoortgang van hun studenten, ongeacht of uitvallers en switchers elders in het systeem voor hoger onderwijs hun studie vervolgen en succesvol kunnen zijn.

Gepercipieerde competentie, de derde indicator voor academisch succes, is gedefinieerd als de mate waarin eerstejaarsstudenten hun capaciteit inschatten om beroepstaken zelfstandig of in samenwerking met andere studenten uit te voeren en hierover duidelijk te communiceren.

Competentie vormt een centraal concept in het hoger beroepsonderwijs en is in dit proefschrift beschouwd als een subjectieve, kwalitatieve tegenhanger van de objectieve, kwantitatieve indicator behaalde aantal credits.

De cijfers van de HBO-raad laten zien dat in ons land in de periode 2005–2010 vijftien tot achttien procent van de ingestroomde studenten het hoger beroepsonderwijs verliet vóór het behalen van een diploma. Tweederde van deze uitval vond plaats in het eerste jaar. Op het niveau van instellingen en opleidingen is dit percentage aanzienlijk hoger dan landelijk. De uitval van eerstejaarsstudenten in de instellingen die in dit proefschrift centraal staan bedroeg ongeveer 35 procent. In dezelfde periode 2005–2010 was de verblijfsduur van studenten die een diploma behaalden in de opleiding van hun eerste keus gemiddeld 51 maanden (landelijk gemiddelde). Uitvallers verbleven ook geruime tijd, gemiddeld 25 maanden, in de opleiding voordat ze vertrokken. Wat betreft gepercipieerde competentie blijkt uit arbeidsmarktonderzoek dat 71% van de hbo-afgestudeerden anderhalf jaar na diplomering hun competenties in hun beroep als goed of excellent beschouwen. Echter, 21% van de afgestudeerden schat dat hun competenties onder het vereiste niveau liggen. Dit contrasteert met het feit dat deze groep een hbo-diploma heeft en dus competent zou moeten zijn.

Het algemene doel van het proefschrift bestaat uit het onderzoeken van een aantal psychologische en interactionalistische factoren waarvan in het debat over studierendement wordt verondersteld dat ze van invloed zijn op uitval, studievoortgang en verwerving van competenties. Maatregelen waarin met deze factoren rekening wordt gehouden zouden leiden tot een grotere effectiviteit van het Nederlandse hoger beroepsonderwijs.
In dit proefschrift zijn drie overkoepelende vragen onderscheiden:

1. In welke mate verklaren psychologische en interactionalistische factoren het academisch succes van eerstejaarsstudenten?
2. Biedt een combinatie van psychologische en interactionalistische factoren toegevoegde waarde voor het verklaren van academisch succes?
3. Werken factoren die gerelateerd zijn aan academisch succes op dezelfde wijze in verschillende omgevingen en voor verschillende groepen?

Theoretische achtergronden

In dit proefschrift is gekozen voor twee theoretische invalshoeken om het academisch succes in het hoger beroepsonderwijs te verklaren. Zowel psychologische concepten die een centrale plaats innemen in een brede verzameling van leer- en motivatietheorieën (Bandura, 1994; Eccles & Wigfield, 2002; Entwistle & Peterson, 2004; Ryan & Deci, 2000), als ook interactionalistische concepten, zoals die bijvoorbeeld worden gebruikt in Tinto's (1993) model van studiestaking, zijn relevant voor het verklaren van academisch succes.

In psychologische benaderingen ligt de nadruk op veelal met elkaar verweven kenmerken uit het motivatie- en leerproces als verklaring voor academisch succes. Onderwijsinnovaties in het hoger beroepsonderwijs waarin actief leren, betekenisgestuurd leren, studentgecentreerd onderwijs, en leren om te leren centrale begrippen vormen hebben hun oorsprong in theorieën over motivatie en leren. Diverse aspecten van motivatie, zoals waarde ('value'), zelfvertrouwen en neiging tot uitstel ('procrastination'), en twee aspecten van leren, namelijk zelfregulatie en diepgaand leren, zijn in het concept betekenisgestuurd leren ('meaning-directed learning') met elkaar verbonden. Studenten met een intrinsieke motivatie, een geringe neiging tot uitstel, zelfvertrouwen, zelfregulerend vermogen en een neiging tot diepgaand leren hebben algemeen meer academisch succes (Eccles & Wigfield, 2002; Entwistle & Peterson, 2004; Schraw et al., 2007). Er zijn echter ook studies die wijzen op een negatief verband tussen diepgaand leren en het behaalde aantal credits.

Hoewel meer modellen zijn voorgesteld en gedeeltelijk of volledig zijn getoetst (Bean & Metzner, 1985; Cabrera, Castañeda, Nora & Hengstler, 1992; Pascarella, 1980; Spady, 1970; Stoecker, Pascarella & Wolfle, 1988), is Tinto's (1975, 1993) studiestakingsmodel verreweg het meest toegepaste en getoetste interactionalistische model (Bijleveld, 1993; Braxton et al., 2004). Tinto (1993) onderscheidt twee typen van betrokkenheid die de individuele kans op studiesucces of uitval voorspellen. De individuele aspiraties ('goal commitments') van een student verwijzen naar zijn/haar intenties om toe te werken naar het bereiken van persoonlijke en onderwijsdoelen. De institutionele betrokkenheid van een student ('institutional commitments') verwijst naar diens bereidheid om de voorgenomen doelen te realiseren binnen een instelling. De mate van individuele en institutionele betrokkenheid kan variëren in de tijd en beide soorten van betrokkenheid kunnen elkaar over en weer beïnvloeden. Door interacties tussen de individuele student en de academische en sociale omgeving van de instelling ontwikkelt de student een bepaalde mate van sociale en academische integratie (Braxton et al., 2004). Dit proces resulteert in de transfer van initiële betrokkenheid naar een gelijke, hogere of lagere mate van betrokkenheid met de eigen doelen en de instelling in latere fasen van de studie. Dit proces wordt verder beïnvloed door andere individuele en institutionele kenmerken. Naar aanleiding van diverse kritieken zijn voorstellen gedaan om Tinto's model uit te breiden met variabelen als 'time on task', intentie om te blijven en aspecten van motivatie- en leerstrategieën die studenten hanteren.

In evaluaties van het interactionalistische model wijzen diverse auteurs erop dat begrippen als sociale en academische integratie belangrijk zijn voor de leer- en motivatiestrategieën van studenten (Astin, 1993; Braxton, 2000; Pascarella & Terenzini, 2005). Maar hoe de relaties precies zijn is vaak niet geëxpliciteerd (Braxton et al, 1997; Bruinsma, 2003). In recent onderzoek zijn de relaties van integratie met motivatie en leren wel vaker onderzocht en aangetoond (Bruinsma, 2003; Severiens & Schmidt, 2009; Severiens & Wolf, 2008; Torenbeek et al., 2010). Andersom wordt vanuit de traditie van het onderzoek naar leren en motivatie het belang van sociale processen regelmatig benadrukt (Wentzel, 1997; Wigfield & Wagner, 2005). Beide theoretische benaderingen hanteren regelmatig het begrip engagement. Engagement blijkt bijvoorbeeld uit de mate waarin studenten tijd besteden aan studie-gerelateerde activiteiten en de motivatie- en leerstrategieën die zij hanteren (Astin, 1993; Harper & Quaye, 2007). In Tinto's theorie is engagement gedefinieerd in termen van initiële en daarop volgende individuele intenties en betrokkenheid bij opleiding en instelling, interacties met mede-studenten en interacties met docenten. Het resultaat van die processen is dat studenten meer of minder studievoortgang boeken en doorgaan met een studie (persisteren) of stoppen (uitvallen). Engagement in betekenisgestuurd leren is besloten in componenten als waarde, zelfvertrouwen, procrastinatie, zelfregulatie en diepgaand leren, en geeft meer aan hoe studenten studeren. Het theoretische kader besluit met het voorstel om concepten die uit interactionalistische en leer- en motivatietheorieën afkomstig zijn te integreren in één model. Een gecombineerd model zou kunnen bijdragen aan betere verklaringen voor studiesucces en uitval.

Opbouw en design van de vijf empirische studies

De theoretische achtergronden zoals hiervoor geschetst vormden de basis voor vijf empirische studies. In hoofdstuk 4 en 5 staan enkele kenmerken van betekenisgestuurd leren centraal. In hoofdstuk 4 zijn de variabelen zelfregulatie, waarde, verwachting (in termen van 'procrastinatie' en zelfvertrouwen), en diepgaand leren onderzocht in relatie met gepercipieerde competentie en het aantal behaalde credits. In hoofdstuk 5 is nagegaan of studenten die zichzelf beschouwen als Nederlands (meerderheidsstudenten) op deze variabelen - aangevuld met self-efficacy en faalangst - verschillen van studenten die zichzelf geheel of gedeeltelijk zien als behorend tot een culturele minderheid (minderheidsstudenten). Vervolgens is bekeken of de relaties van deze variabelen met het aantal behaalde credits verschillend zijn voor beide groepen.

Een interactionalistische benadering is gevolgd in hoofdstuk 6 en 7. In deze twee hoofdstukken zijn de relaties van individuele achtergrondkenmerken en betrokkenheid onderzocht van studenten in relatie met uitval en/of het behaalde aantal credits in het eerste jaar van het hoger beroepsonderwijs. De achtergrondvariabelen waarnaar is gekeken zijn: het type voortgezet onderwijs, eindexamencijfer wiskunde, voorbereiding op actief leren in de vooropleiding, voorbereiding op kennis en vaardigheden in de vooropleiding. De variabelen in verband met de betrokkenheid die in de studies zijn opgenomen zijn: aantal uren contacttijd en zelfstudie, tevredenheid met actief leren, tevredenheid met academische kennis en vaardigheden, sociale integratie, academische integratie, intentie om te blijven. In hoofdstuk 6 zijn mannen en vrouwen in techniekopleidingen vergeleken op deze kenmerken en is nagegaan of de relaties onderling en met uitval en studievoortgang verschillen naar geslacht. In hoofdstuk 7 zijn vier sectoren in het hoger beroepsonderwijs vergeleken op dezelfde kenmerken en op de relaties met studievoortgang.

De studie in hoofdstuk 8 is een uitwerking van de gedachte van een gecombineerd model. Nagegaan is in hoeverre de mate van sociale en academische integratie van invloed zijn op enkele kenmerken van betekenisgestuurd leren.

De data voor de vijf studies in dit proefschrift zijn verzameld met twee vragenlijsten die zijn afgenomen bij eerstejaarsstudenten van vijf hogescholen in het noordoosten van Nederland. Eén vragenlijst, afgenomen bij de eerstejaarscohorten 2008–2009, is gebaseerd op een interactionalistische benadering, met items over individuele achtergrondkenmerken en betrokkenheid bij de opleidingen. Een tweede instrument dat is afgenomen bij eerstejaarsstudenten van de cohorten 2006–2007 en 2008–2009 van drie hogescholen, is opgezet vanuit een psychologisch begrippenkader. Deze vragenlijst bevatte vragen over de percepties van studenten aangaande hun motivatie- en leerstrategieën en hun actuele studiegedrag. Vervolgens zijn de datasets gekoppeld aan de uitval- en studievoortganggegevens van de respondenten. De analyses in de diverse hoofdstukken bestaan uit descriptieve statistieken, principale componenten analyse en betrouwbaarheidsanalyse, correlaties en lineair structurele modellen.

Conclusies

Factoren uit verschillende theorieën die academisch succes verklaren

Als antwoord op de eerste onderzoeksvraag is allereerst onderzocht of psychologische factoren die in verband met motivatie en leren worden onderscheiden invloed hebben op studievoortgang en competentie (hoofdstuk 4). In het hoofdmodel (‘main model’) is studievoortgang in verband gebracht met vier variabelen. In een afnemende volgorde van gewicht verklaarden procrastinatie, zelfregulatie en, ex aequo, waarde en gepercipieerde competentie, het aantal credits dat studenten behaalden in het eerste jaar. De uitkomsten van het hoofdmodel vergeleken we met die van een alternatief model ('reversed path model'). In dat model waren waarde en zelfregulatie de belangrijkste verklarende factoren van gepercipieerde competentie, gevolgd door diepgaand leren en het behaalde aantal credits. In beide modellen was het verband tussen het behaalde aantal credits en gepercipieerde competentie zwakker dan verwacht zou mogen worden bij opleidingen die credits toekennen op basis van verworven competenties. In een tweede studie is het psychologische model uitgebreid met de variabelen self-efficacy, faalangst, en zelfvertrouwen (hoofdstuk 5). De analyses lieten zien dat zelfvertrouwen de belangrijkste factor voor het verklaren van studievoortgang was, ongeacht of deze voor meerderheids- of minderheids- studenten werden uitgevoerd (zie Tabel A).

Tabel A: Psychologische factoren die van invloed zijn op studievoortgang, in volgorde van belangrijkheid

Hoofdstuk	Variabelen
4	Procrastinatie, zelfregulatie, waarde/gepercipieerde competentie
5	Zelfvertrouwen, waarde, procrastinatie, self-efficacy
8	Zelfvertrouwen, procrastinatie, waarde

In interactionalistische modellen vonden we dat intentie om te blijven in dezelfde opleiding de belangrijkste factor was die invloed heeft op studievoortgang en uitval (hoofdstuk 6 en 7). Bijna de helft van de 17% respondenten die drie maanden na de start twijfels had over of ze na het eerste jaar wel wilden blijven in de opleiding viel daadwerkelijk gedurende of aan het eind van het eerste jaar uit. Het percentage studenten dat niet de intentie had om te blijven is in werkelijkheid wellicht groter, omdat de blijvers oververtegenwoordigd waren in de steekproef van dit onderzoek. Andere factoren in verband met achtergrondkenmerken, voorbereiding en betrokkenheid hadden een geringere invloed op de uitval. In afnemende volgorde van invloed op studievoortgang waren: tevredenheid met actief leren in het eerste jaar, tevredenheid met kennis en vaardigheden in het eerste jaar, de mate van integratie, voorbereiding op actief leren in de vooropleiding, zelfstudie, geslacht, voorbereiding op kennis en vaardigheden in de vooropleiding, contacturen, en type vooropleiding (havo, vwo of mbo). De invloed van deze factoren op academisch succes verliep meestal indirect via tevredenheid, integratie en intentie om te blijven, .

Combineren van psychologische en interactionalistische factoren

Als antwoord op de tweede onderzoeksvraag is een gecombineerd model getest waarin psychologische en interactionalistische factoren zijn samengenomen ter verklaring van studievoortgang (hoofdstuk 8). De analyse van dit model liet zien dat de indirecte invloed van sociale en academische integratie op studievoortgang via zelfregulatie en diepgaand leren significant was. De invloed van zelfregulatie en diepgaand leren op studievoortgang was echter gering. De geringe beïnvloeding van deze factoren door sociale en academische integratie, maakte dat de invloed van integratie op studievoortgang via zelfregulatie en diepgaand leren ook gering was. Daar staat echter tegenover dat de invloed van zelfvertrouwen, procrastinatie en waarde op studievoortgang substantieel was in het gecombineerde psychologisch/ interactionalistische model. Dat komt gedeeltelijk door de invloed van sociale en academische integratie op deze variabelen. De indirecte invloeden van sociale en academische integratie op studievoortgang waren dus per saldo gering maar wel significant. Dit betekent dat het combineren van factoren die afkomstig zijn uit verschillende theoretische benaderingen kan leiden tot verbeteringen in het verklaren van academisch succes in het hoger onderwijs.

Verschillen tussen disciplines en groepen

Voor het beantwoorden van de derde onderzoeksvraag onderzochten we of factoren die in een psychologisch of interactionalistisch model worden onderscheiden op een zelfde manier werken voor studenten die behoren tot verschillende groepen naar geslacht, etniciteit, of discipline (hbo-sector).

De invloeden van motivationele factoren en diepgaand leren op studievoortgang zijn vergeleken voor minderheids- en meerderheidsstudenten (hoofdstuk 5). Voor *minderheidsstudenten* vonden we dat faalangst van invloed was op procrastinatie. Minder faalangst leidde tot een grotere neiging om uit te uitstellen. Faalangst en procrastinatie hadden echter geen effect op studievoortgang van deze groep. Evenmin hadden zelfregulatie en diepgaand leren effect op studievoortgang van minderheidsstudenten. Echter, self-efficacy (op indirecte wijze), waarde en zelfvertrouwen (beide op een directe wijze) leidden wel tot meer studievoortgang bij deze groep. Voor *meerderheidsstudenten* leidde meer self-efficacy tot minder faalangst, beïnvloedde faalangst diepgaand leren (minder faalangstige studenten vertoonden een lager niveau van diepgaand leren), en zelfregulatie had een positieve invloed op diepgaand leren. Minder neiging tot uitstel leidde tot meer studievoortgang voor deze groep.

Een vergelijking tussen mannelijke en vrouwelijke studenten in de sector techniek liet zien dat vrouwen meer tijd besteedden aan zelfstudie, een iets hogere waardering hadden van de mate van sociale integratie, meer studiepunten behaalden en minder uitvielen (hoofdstuk 6). Voorbereiding op actief leren in de vooropleiding had een negatieve invloed op het academische succes van vrouwen in techniek. Verder ging er een positief effect uit van zelfstudie op het behaalde aantal credits van deze vrouwen, en ook - zij het in geringere mate - op hun blijven in de opleiding. Bij mannen werd dit effect van zelfstudie niet gevonden, maar bij deze groep was de invloed van het aantal contacturen, hoewel gering, toch belangrijker voor academisch succes dan bij vrouwen. Vrouwen bleken ook gevoeliger voor interacties met docenten. Een hogere mate van academische integratie had bij deze groep een positieve uitwerking op hun studievoortgang en blijven in de opleiding na het eerste jaar. Dit effect was minder sterk voor het academisch succes van mannen in techniek. Ook vonden we dat sociale integratie het academisch succes van beide geslachten positief beïnvloedde. Dit resultaat was in tegenstelling tot de verwachting dat sociale integratie belangrijker zou zijn voor mannen dan voor vrouwen. Verdere analyses (hoofdstuk 7) gaven aan dat geslacht en type voortgezet onderwijs (havo of mbo) ook in andere sectoren uiteenlopend bijdragen aan het verklaren van verschillen in academisch succes.

Tot slot is ter beantwoording van onderzoeksvraag 3 een generiek interactionalistisch model ontwikkeld en getest voor de hbo-sectoren economie, techniek, gezondheidszorg en sociale studies (hoofdstuk 7). De vijf modellen hadden gemeenschappelijk dat intentie om te blijven de belangrijkste factor was voor het verklaren van studievoortgang. Deze factor gaf ook voor een deel de invloeden op studievoortgang door van andere variabelen als tevredenheid met actief leren, tevredenheid met academische kennis en vaardigheden en sociale en academische integratie. In andere opzichten varieerde de invloed van factoren die in het generieke model belangrijk waren voor studievoortgang over de vier sectoren. Het aantal gerapporteerde contacturen was bijvoorbeeld relatief belangrijk in gezondheidszorg en sociale studies. Zelfstudie deed er vooral toe in economie en gezondheidszorg. Vrouwen presteerden beter dan mannen in economie, techniek en gezondheidszorg. Een goede voorbereiding op actief leren in de vooropleiding liet een negatief effect zien op studievoortgang in economie, techniek en sociale studies. De conclusie was dat het generieke model hielp bij de identificatie van factoren die belangrijk zijn voor studievoortgang. Maar specificatie van verbanden voor de vier sectoren resulteerde in betere aanwijzingen voor de factoren die een gering academisch succes verklaren. Tabel B geeft een samenvatting van de resultaten voor verschillende groepen studenten.

Tabel B: Factoren die van invloed zijn op studievoortgang voor verschillende groepen studenten

Psychologische variabelen	Minderheid	Self-efficacy, waarde, zelfvertrouwen
	Meerderheid	Zelfvertrouwen, procrastinatie, waarde
Interactio-nalistische variabelen	Vrouwen	Academische integratie, intentie om te blijven, voorbereiding op actief leren (–), zelfstudie
	Mannen	intentie om te blijven, examencijfer wiskunde, academische integratie
	Economie	Intentie om te blijven, tevredenheid met actief leren, tevredenheid met kennis en vaardigheden, integratie/voorbereiding op actief leren in de vooropleiding (–), zelfstudie
	Techniek	Intentie om te blijven, integratie, tevredenheid met actief leren, tevredenheid met kennis en vaardigheden
	Gezondheidszorg	Intentie om te blijven, zelfstudie, contacturen
	Sociale studies	Intentie om te blijven, contacturen, voorbereiding op actief leren in de vooropleiding (–)

Concluderend, het maken van onderscheid van groepen studenten naar, etniciteit, geslacht en discipline is belangrijk om te komen tot meer valide analyses van factoren die academisch succes verklaren. Algemene verklaringen zijn niet rechtstreeks van toepassing op alle subgroepen en omgevingen binnen een instelling.

Beperkingen

Een beperking in dit proefschrift is het gebruik van een cross-sectioneel design. Een longitudinaal design had wellicht geresulteerd in meer concrete aanwijzingen voor geschikte momenten voor groeps- of discipline-specifieke interventies. Het was interessant geweest om te onderzoeken hoe de intentie om te blijven, nu alleen drie maanden na de start in het eerste jaar gemeten, zich ontwikkelt in de loop van het eerste jaar. Andere studies laten zien dat eerstejaarsstudenten vooral vlak na de kerst en gedurende het eerste semester overwegen te vertrekken (Thomas, 2012). Het is niet bekend wanneer precies de twijfelende studenten in onze steekproef besloten om de studie te staken. In verband hiermee moet vermeld worden dat niet is onderzocht of deze studenten overwogen om gedurende het eerste jaar te switchen. Verder is het aannemelijk dat in de eerstejaarspopulatie meer studenten zijn die twijfelen aan hun studie dan in de steekproef. Een andere beperking betreft de lage samenhangen van factoren die zijn onderscheiden in het kader van betekenisgericht leren met academisch succes in termen van het behaalde aantal credits. Deze lage samenhangen bestaan echter al langer (Bruinsma, 2004; Entwistle & Peterson, 2004; Hattie, 2009). Samen verklaren de factoren self-efficacy, zelfvertrouwen, procrastinatie, waarde en zelfregulatie gedeeltelijke het academisch succes van studenten en bieden ze aanknopingspunten voor interventies. Een volgende beperking is dat in dit proefschrift niet vanuit een organisatorisch perspectief naar academisch succes is gekeken. Een uitbreiding van de modellen met variabelen als curriculumkenmerken (Jansen, 1996; Van den Berg & Hofman, 2005), samenstelling van de studentpopulatie (Severiens & Ten Dam, 2012; Mastekaasa & Smeby, 2008; Tison, Bateman & Culver, 2011), of de student-docent ratio, had kunnen resulteren in grotere proporties verklaarde variantie in academisch succes. Ontbrekende data op individuele en geaggregeerde niveaus belemmerden het gebruik van een multilevel design dat geschikt is om dergelijke kenmerken mee te nemen in de analyses. Gerelateerd aan dit probleem is dat de grootte van de steekproeven in de studies varieerde van 21% tot 30%. Bekend is (Kamphorst & Oostindiër, 2008) dat goed presterende studenten oververtegenwoordigd zijn bij geringe responspercentages.

Theoretische implicaties

Het combineren van factoren uit verschillende theoretische benaderingen leidt mogelijk tot betere verklaringen van academisch succes in het hoger onderwijs (vgl. Beekhoven, 2002; Braxton et al., 1997; Bruinsma, 2003; Torenbeek, 2011). Zowel psychologische als interactionalistische modellen leveren verklaringen voor academisch succes in het hoger onderwijs. Het is echter lastig om te concluderen dat één van beide modellen de voorkeur verdient bij het onderzoek naar academisch succes. In plaats daarvan is beargumenteerd dat een conceptueel model dat beide benaderingen combineert wellicht meer geschikt is voor dat doel. In hoofdstuk 8 is een dergelijk interactionalistisch/psychologisch model onderzocht. De conclusie luidt dat sociale en academische integratie een indirect effect hebben op academisch succes via verschillende psychologische variabelen. Een gecombineerd interactionalistisch/ psychologisch model zou om die reden een richting voor verder onderzoek kunnen zijn.

Een tweede theoretische implicatie is dat verder onderzoek van de effecten van hoger beroepsonderwijs zich zou kunnen richten op een breed spectrum van uitkomsten (Covington, 2000; Pascarella & Terenzini, 2005). Studievoortgang en competentie zijn twee soorten uitkomsten die mogelijk met elkaar concurreren (Covington, 2000). De analyse in hoofdstuk 4 laat zien dat een sterk verband tussen het behaalde aantal credits en gepercipieerde competentie niet vanzelfsprekend is. Een taak voor toekomstig onderzoek zou kunnen zijn om na te gaan hoe en onder welke condities leer- en motivatiestrategieën van studenten resulteren in een sterkere link tussen het behalen van credits en gepercipieerde competentie. Gepercipieerde competentie meten met meer items zou bijdragen aan een bredere inhoudelijke dekking van het begrip en differentiatie tussen groepen en studiejaren.

Een derde implicatie van dit proefschrift is dat onderzoek van het hoger onderwijs zich meer zou kunnen richten op de vraag naar de effectiviteit van innovaties en interventies die zijn ontworpen om de overgang van voortgezet onderwijs naar hoger onderwijs te versoepelen. We zagen dat het aantal contacturen vergeleken met zelfstudie-uren een relatief geringe invloed heeft op studievoortgang, en dat deze invloed kan verschillen van groep tot groep. Ook kunnen de effecten van individuele factoren die verband houden met de vooropleiding (het examencijfer voor wiskunde, de voorbereiding op actief leren in de vooropleiding; zie hoofdstuk 6 en 7) geringer zijn dan verwacht of tegenovergesteld zijn aan de bedoeling van interventies in het onderwijs. Verder onderzoek zou zich om die reden moeten richten op de ‘evidence base’ van onderwijsinnovaties. De bevindingen die daaruit naar voren komen conflicteren mogelijk met de bestaande onderwijspraktijk en de verwachtingen over de uitkomsten van innovaties.

Dit proefschrift heeft ook laten zien dat de verbanden tussen een reeks van factoren onderling en hun invloed op academisch succes variëren voor verschillende groepen studenten, bijvoorbeeld naar etniciteit (Boekaerts, 1999) en geslacht (Felder & Brent, 2005; Seymour & Hewitt, 1997). Een vierde implicatie die hieruit volgt is dat verder onderzoek aandacht dient te blijven besteden aan deze verschillen in individuele karakteristieken in relatie tot academisch succes. Pascarella en Terenzini (2005) noemen dit het vraagstuk van de ‘conditionele effecten’. Dit onderzoek betreft het verklaren van verschillen in academisch succes op basis van verschillende loopbanen in het voortgezet onderwijs, eerste generatie studenten (met ouders zonder hoger onderwijs) versus tweede generatie studenten (met ouders die hoger onderwijs volgden), studenten die al dan niet vrijwillig uitvallen, of excellente, gemiddelde of achterblijvende groepen studenten. Op een zelfde wijze zou institutioneel onderzoek meer aandacht moeten besteden aan disciplinaire verschillende als verklaring voor verschillen in academisch succes (Becher 1994). In termen van Pascarella en Terenzini (2005) wordt dit het vraagstuk van tussenschoolse effecten (‘within-college effects’) genoemd. Ook zou de variëteit in het niveau van voorbereiding van studenten als gevolg van verschillen tussen toeleverende scholen deel moeten uitmaken van deze benadering (vgl. Torenbeek, 2011). Als aanvulling op de benadering die in dit proefschrift is gevolgd, zou kwalitatief onderzoek meer inzichten kunnen opleveren in de factoren die studievoortgang en uitval van studenten in het hoger beroepsonderwijs beïnvloeden.

Praktische implicaties

Ondanks vele onderzoeken en interventies op het niveau van opleidingen, instellingen, en het systeem van hoger onderwijs, vormen geringe efficiëntie en effectiviteit van het hoger onderwijs in termen van studievoortgang, uitval en competentie nog steeds een hardnekkig probleem in het hoger beroepsonderwijs in Nederland. Enkele praktische lessen op macro-, meso- en micro- niveau van hoger onderwijsinstellingen (Jansen & Terlouw, 2009) zouden gehaald kunnen worden uit dit proefschrift.

De praktijk zou meer rekening kunnen houden met de verschillen in verbanden tussen psychologische of interactionalistische variabelen en academisch succes voor uiteenlopende studentgroepen en disciplines. De resultaten die worden gevonden in verschillende contexten en groepen laten zich niet rechtstreeks vertalen naar andere contexten en groepen. Instellingen doen er goed aan hun beleid en interventies gericht op het verbeteren van het rendement niet alleen te baseren op algemene modellen uit literatuur of onderzoek elders, maar na te gaan welke 'evidence base' er voor is dat maatregelen binnen de eigen context, opleidingen en studentgroepen zullen werken. Dit proefschrift laat bijvoorbeeld zien dat contacturen effect hebben op studievoortgang in de sectoren gezondheidszorg en sociale studies, terwijl zelfstudie meer effect heeft op studievoortgang in economie en gezondheidszorg. In de sector techniek is het effect van contacturen en zelfstudie op studievoortgang gering wanneer studenten als één groep worden beschouwd. Maar uit analyses waarin specifiek naar geslacht wordt gekeken blijkt dat het aantal contacturen relatief belangrijker is voor mannen, en dat zelfstudie voor vrouwen wel maar voor mannen niet een belangrijke factor is. Deze resultaten betekenen dat een algemene maatregel op instellingsniveau met betrekking tot contacturen wellicht niet effectief is. Op een vergelijkbare manier blijken tevredenheid met actief leren en academische kennis en vaardigheden invloed te hebben op studievoortgang van studenten in de sector economie terwijl deze effecten minder sterk zijn in de sectoren techniek en sociale studies, en afwezig zijn in de sector gezondheidszorg. In de sector techniek varieert de invloed van de tevredenheid met actief leren en kennis en vaardigheden naar geslacht. Zo verschilt ook de invloed van voorbereiding op actief leren in de vooropleiding, voorbereiding op kennis en vaardigheden in de vooropleiding, geslacht, integratie, en type vooropleiding per discipline. Algemene interventies toegepast op alle opleidingen binnen een instelling kunnen leiden tot gedeeltelijk succes in sommige disciplines, maar kunnen gemakkelijk leiden tot het tegendeel ervan bij andere disciplines. Dat betekent dat er geen blauwdrukken bestaan voor het succes van studenten (Kuh et al., 2010). Een implicatie hiervan is dat instellingen en opleidingen de analyse en het gebruik van discipline-specifieke gegevens over hun studenten meer systematisch zouden moeten opnemen in hun planning- en controlcyclus (Posey & Wijesinghe, 2012; Saupe, 1990). Analyse van deze discipline-specifieke gegevens houdt niet alleen in dat wordt vastgesteld of de actuele waarden van prestatie-indicatoren en de onderliggende variabelen voldoen aan grenswaarden, maar ook of en hoe deze variabelen discipline-specifieke uitkomsten van het onderwijs beïnvloeden. Instellingen slaan deze tweede component van data-analyse regelmatig over. Wanneer de invloed van deze variabelen relatief laag is of niet consistent over sectoren of groepen studenten, dan zal overwogen moeten worden of deze variabelen nader gespecificeerd, verwijderd of vervangen moeten worden.

Op de tweede plaats dienen docenten zich er bewust van te zijn dat ze een belangrijke sleutel zijn voor de kwaliteit van de interacties van studenten met de leeromgeving en hun ‘gevoel erbij te horen’. In Tinto’s (1993) model zijn sociale en academische integratie van studenten centrale componenten. Dit proefschrift laat zien dat in het bijzonder academische integratie belangrijk is voor de motivatie en verwachtingen van studenten in termen van waarde, zelfvertrouwen en neiging tot uitstelgedrag en uiteindelijk voor hun academisch succes. Het is belangrijk dat docenten vaardigheden gebruiken waarmee ze studenten ondersteunen. Veel ervaringen en onderzoeken wijzen erop dat docenten in deze vaardigheden zijn te trainen (Andrews, Clark & Thomas, 2012; Pascarella & Terenzini, 2005). ‘Goede’ vaardigheden zijn bijvoorbeeld het gebruik van strategieën gericht op actief en samenwerkend leren, omgaan met diversiteit, geven van de juiste steun bij het leren en geven van feedback, creëren van leercommunities en creëren van veilige leeromgevingen (Chickering & Gamson, 1987; Hattie, 2007, 108 – 128; Kuh, Kinzie, Buckley, Bridges & Hayek, 2007; Kuh, Kinzie, Schuh, Whitt & Associates, 2010; Pascarella & Terenzini, 2005, 144 – 119).

Op de derde plaats bevestigt dit proefschrift dat interventies gericht op individuele psychologische factoren (het micro-niveau) belangrijk blijven. De interventies van de praktijk in voorgezet onderwijs en hoger beroepsonderwijs zouden meer en beter op elkaar afgestemd moeten zijn. Interventies die studenten ondersteunen bij de juiste studiekeuze zijn: geven van juiste informatie over het aanbod en de inhouden van opleidingen, toerusten met de juiste kennis en vaardigheden die studenten in staat stellen de studie van hun voorkeur te kiezen, stimuleren om de juiste verwachtingen te creëren en faciliteren van vroege betrokkenheid van studenten met ouderejaarsstudenten en docenten nog voordat ze de opleiding instromen (Hossler, Schmitt & Vesper, 1999; Thomas, 2012).

Veel interventies rond het ondersteunen van studenten gedurende de eerste maanden van de propedeuse zijn gericht op hun betrokkenheid (‘engagement’; Kuh et al., 2007) of gevoel erbij te horen (‘sense of belonging’; Hurtado & Carter, 1997; Meeuwisse et al., 2010; Thomas, 2012). Deze interventies betreffen de sociale interacties met docenten en medestudenten binnen en buiten de onderwijsruimtes, resulterend in sociale en academische integratie, studiegedrag in termen van bijwonen van contacturen of zelfstudie en aanwenden van de juiste leer- en motivatiestrategieën (Kuh, et al., 2010; Tinto, 1993, 2012; Thomas, 2012). Deze interventies kunnen helpen bij het versterken of het ontwikkelen van de intentie van studenten om in de opleiding te blijven. Deze intentie om te blijven is de belangrijkste factor voor studievoortgang en voltooiing van de studie. Voor sommige groepen studenten, bijvoorbeeld vrouwen in techniek, is de juiste studiekeuze en de intentie om te blijven vanaf het begin van de het eerste jaar vanzelfsprekend (hoofdstuk 6). Maar voor een significante groep wordt de ‘intentie om te blijven’ gevormd gedurende de eerste maanden in het hoger onderwijs. Dat betekent dat deze factor kan dienen als een hefboom zijn bij het terugdringen van uitval in het eerste jaar. Om deze intentie te versterken of te ontwikkelen is het belangrijk studenten die twijfels hebben over hun studie te ondersteunen door gesprekken met mentor- en studieloopbaanbegeleiders. De invloed die studenten ervaren van instelling en opleiding, docenten en mede-studenten, het studiegedrag dat ze inzetten en leren te waarderen gedurende deze eerste periode van het eerste jaar, kan ertoe bijdragen dat de effectiviteit en efficiëntie van instellingen in het hoger beroepsonderwijs toenemen.

Dankwoord

Dit proefschrift was mogelijk dankzij de financiële bijdragen van de Hanzehogeschool Groningen, de Rijksuniversiteit Groningen en Saxion Hogescholen. Bij het schrijven van dit proefschrift voelde ik me gesteund door velen.

Allereerst ben ik veel dank verschuldigd aan mijn begeleiders. Mijn promotor Adriaan Hofman en mijn co-promotores Ellen Jansen en Cees Terlouw waren onvermoeibaar in het voorzien van commentaren op mijn concepten en versies van artikelen en hoofdstukken. Ik heb veel van hen geleerd.

Joost Degenaar van de Hanzehogeschool Groningen dank ik voor zijn bemiddeling bij de goedkeuring van het onderzoeksvoorstel. Het was niet vanzelfsprekend dat medewerkers van stafbureaus opteerden voor een promotieplaats. Ik dank ook alle overige collega's van de Hanzehogeschool Groningen voor hun steun en interesse in waar ik mee bezig was. Zonder anderen tekort te willen doen noem ik Frits Salomons, Dick Zevenhuijzen, Joop Oostindiër, Wouter Scholten, Monique Drent-Zwinderman, Jolanda Eerelman, Bob Schoonbeek en Marjan Groenhuis voor hun bijdragen. Anne Boomsma van de Rijksuniversiteit Groningen ben ik erkentelijk voor zijn adviezen voor het gebruik van lisrel.

Roel van Asselt, lector Instroom- en aansluitingsmanagement bij Saxion Hogescholen, reageerde enthousiast op het onderzoeksvoorstel. Hij en Caroline van der Molen maakten co-financiering van mijn onderzoek door Saxion Hogescholen mogelijk. Mijn deelname aan de kenniskring van Roel en daarna Cees Terlouw droeg in hoge mate bij aan mijn motivatie om door te gaan met het onderzoek. De contacten op Saxion met onder andere de kenniskringleden Nine Schuppen, Marjan Kienhuis, Hans de Vries, Safoura Ghaeminia, Fanny Pliester, Janet van der Veen-Drijver waren daarin heel belangrijk. De bezoeken aan de Onderwijsresearchdagen in Eindhoven, Leuven, en Enschede, en EApril in Lissabon waren leerzaam en gezellig.

Een woord van dank richt ik aan Pieter Jansen, Marjan Kienhuis, Jelle Nauta, Carlo van Varsseveld, Mark Geerts en Jeanet Schuring, die de laatste jaren de 'harde' kern vormden van de werkgroep Aansluitingsmonitor noordoost Nederland. Het is heel bijzonder dat een werkgroep waarin zes, later helaas vijf, hogescholen samenwerken zo lang bestaat. De gegevens verzameld door de werkgroep vormden voor mij de eerste aanleiding voor verdere analyses. In

het bijzonder dank ik Pieter voor de nauwgezette wijze waarop hij in het project de data beheert en voor zijn bijdrage aan de aanvullende dataverzameling. Ik heb daar veel aan gehad. Ik hoop de komende periode meer tijd te kunnen besteden aan de analyses voor de monitor.

Mijn dank gaat uit naar de collega's van de bij de aansluitingsmonitor betrokken hogescholen die op een of andere wijze betrokken waren bij de dataverzameling en de levering van studievoortganggegevens. Onmisbaar voor dit onderzoek waren alle studenten van de deelnemende hogescholen die bereid waren te responderen in de aansluitingsmonitor en de aanvullende vragenlijsten.

Michel Berends en Els Loeff dank ik voor het vervullen van rol van paranimf.

Mijn broer Evert en schoonzus Martine dank ik voor het kritisch doorlezen van de Nederlandstalige samenvatting. Dank aan mijn zus Christien voor het nog een keer doorlezen van dit dankwoord.

Tot slot denk ik aan mijn ouders, die heel trots zouden zijn als ze mijn promotie hadden meegemaakt. Zij, mijn broer en zussen vormden het nest waar ik uit voortkom en zonder wie ik nooit een dissertatie had geschreven.

Jan Kamphorst
Groningen, september 2013